Infectious disease legislation – legislation overview and lessons learned

Evidence review

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July 2020

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Published by:

Health Research Board, Dublin

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Abbreviations

Abbreviation	Explanation
CI	confidence interval
DOH	Department of Health
ECDC	European Centre for Disease Prevention and Control
EU	European Union
GP	general practitioner
HPSC	Health Protection Surveillance Centre
HRB	Health Research Board
HSE	Health Service Executive
IHR	International Health Regulations
JEE	Joint External Evaluation
MMAT	Mixed Methods Appraisal Tool
N/A	not applicable
NHS – National Health Service	NHS – National Health Service
NSW	New South Wales
RR – relative risk	RR – relative risk
WHO	World Health Organization

Executive summary

Purpose

This evidence review aims to inform and feed into the business case for the new public health framework proposed by the Department of Health (DOH). This evidence review and the proposed new public health framework will act as a key reference for public consultation, service delivery, and stakeholder engagement for the drafting of new public health legislation.

Research questions

The DOH proposed the following research questions for this review:

1. What new or replacement overarching public health legislation, including communicable/infectious disease legislation, have countries introduced since the IHR 2005? (State or provincial level legislation to be included in Federal countries)
2. What were the lessons learned from the national experience of introducing new overarching legislation for public health, including communicable/infectious diseases? (State or provincial level legislation to be included in Federal countries)

Methods

Systematic review methods were used for the purposes of this evidence review. Systematic searching of databases was carried out during July and August 2019. This was supplemented by a grey literature search. Search terms were devised by an information specialist.

Abstracts and full papers identified by systematic database searching were screened for eligibility by two independent researchers. Eligibility for inclusion in this review was based on predetermined criteria.

Country selection was based on the eligibility criteria, and only countries where the public health legislation was translated into English were included. The DOH indicated some English-speaking countries of interest, and of these, Australia, Canada, and Scotland were eligible for the review. Grey literature searching identified the Netherlands as a country of interest, while three other European Union countries (Croatia, Finland, and Portugal) were identified through country responses sought via the European Centre for Disease Prevention and Control (ECDC). Following review of the legislation at state/provincial level, four Australian states (New South Wales (NSW), South Australia, Western Australia, and Victoria), and three Canadian provinces (British Columbia, Manitoba, and Newfoundland and Labrador) were deemed eligible for inclusion.

Data from all included full papers and legislative instruments were extracted into bespoke extraction sheets in Microsoft Excel. Following extraction, data synthesis was carried out through an overview analysis for Question 1 and through a qualitative thematic approach for Question 2. Extracted data for Question 1 were mapped to categories based on the content of the legislative sections, whereby categories were based on the core capacities of the International Health Regulations (IHR) and suggestions from the DOH. Extracted data for Question 2 were validated and verified by two independent researchers against a clean copy of the publication in order to minimise bias, and thematic synthesis was carried out. The International Labour Organization's definition of a lesson learned was used as a standard. Quality appraisal of full papers was carried out using the Mixed Methods Appraisal Tool.

Findings

Question 1: legislation

Seven countries and seven states/provinces were eligible for inclusion in this review. The group included five European unitary states, two federal countries, four Australian states, and three Canadian provinces. Overall, 49 legislative instruments were identified, including overarching acts and regulations made under these acts. In total, 2,090 legislative sections were extracted and

mapped to categories. Once mapped, the sections were counted, and the categories were represented as a percentage of each country's public health legislation.

Overall, the category 'control and treatment' was identified as having the most mapped sections, representing 23% of all studied health legislation. Scottish public health legislation in particular devoted a large proportion of text to these measures, which comprised 55% of Scotland's national public health legislation.

Following 'control and treatment', we identified 'emergency preparedness and prevention' as the next most highly represented category, particularly in federal Australian public health legislation, 35% of which addressed this category. 'Surveillance and notification' for monitoring disease occurrence was third; this category was highly represented in Portuguese Law No. 81/2009 of August 21, accounting for 30% of this law. 'Officers and designated offices' was fourth; it was also highly represented in Portuguese Law No. 81/2009 of August 21, accounting for 22% of this law. 'Ministerial and political interface' was fifth; this category was most highly represented by federal Canadian public health legislation, accounting for 16% of such legislation. 'Resources' was sixth, and did not account for a high percentage of any of the national public health legislation studied. 'Laboratory' emerged as being the least represented category, accounting for less than 1% of the overall public health legislation studied. Further categories not aligning with the core capacities of the IHR were studied, and sections mapped to these categories were represented as percentages of each country's public health legislation.

While similar approaches to public health legislation were taken throughout the countries studied, a few interesting exceptions emerged. For example, Australian public health legislation contains a sunset clause, Croatian health workers must undergo mandatory medical testing, the Public Health etc. (Scotland) Act 2008 contains provisions for sunbed use, and the Australian state of Victoria has incorporated social determinants of health into its Public Health and Wellbeing Act 2008.

Question 2: lessons learned

In Question 2, the Health Research Board (HRB) identified lessons learned from implementing the new overarching public health acts from the selected countries. We utilised the International Labour Organization's definition of a lesson learned: "A lesson learned is an observation from project or programme experience which can be translated into relevant, beneficial knowledge by establishing clear causal factors and effects."

Forty-one studies were identified which reported lessons learned relating to all aspects of public health. They included 26 studies on infectious disease; 7 on social determinants of health and health equity; 3 on vaccination; 2 on business compliance with public health standards; 2 on pollution, including water pollution; and 1 on non-communicable diseases. As infectious disease is the primary focus of the new public health legislation to be developed for Ireland, a thematic synthesis of the 26 papers pertaining to infectious disease was carried out.

The majority of these studies were from Australia (16 out of the total of 26). Seven themes emerged from the synthesis of the lessons learned from implementing new overarching public health legislation for infectious diseases. The first three are IHR core capacities: 'emergency preparedness and prevention', 'surveillance and notification', and 'control and treatment'. The remaining themes were 'allocation of funding', 'defining roles and required expertise', 'working across legislative and organisational boundaries', and 'public trust'.

Emergency preparedness and prevention

A lack of IHR awareness may affect coordination of IHR reporting and hinder further development of IHR capacity, for example in zoonotic sectors. Canada has a number of initiatives to increase awareness of the IHR. These include formal and informal training opportunities for stakeholders in order to ensure a common understanding of obligations under the IHR; also included are formal and informal training opportunities for IHR champions, who promote training and share assessment results with other government stakeholders.

In all countries considered in this review, the Department of Health had the overarching responsibility for public health. However, in a public health emergency, additional organisations

could be drafted in. In Australia, emergency acts (which are entirely separate from public health acts) can also be triggered in the case of pandemics or other public health emergencies. Governments can utilise additional resources (e.g. staff and equipment) from non-health Government Departments when an emergency act is triggered.

Flexibility in the legislation facilitates a tailored deployment of powers and allows timely revision of response plans depending on the severity of a disease. Flexible measures include temporary legislative arrangements, the option to trigger an emergency act, and the use of less prescriptive legislation. Any powers written under less prescriptive legislation should be subject to strict legal safeguards, such as short durations of emergency declarations and rights of appeal.

A World Health Organization (WHO) review of IHR preparedness in Finland highlighted that it is best practice to run preparedness exercises in order to test legislation and policies for effectiveness.

Surveillance and notification

Two audits from Victoria, Australia, found that when notified cases were followed up, either by public health staff or by an automatic redirection to an enhanced surveillance form, demographic data were more likely to be reported.

Timely notification is critical in implementing preventative methods. Notification weeks or months after occurrence is irrelevant and a waste of resources for all involved. Educating doctors about the importance of complete notifications helps to ensure appropriate and timely notification. Removing the need for manual entry of notification data during periods of increased demand helps to ensure the timely receipt of information. Electronic reporting and web-based systems result in delivering more timely notifications than can be achieved by post and fax.

Control and treatment

Additional scenarios may warrant detention/quarantine measures. These include public health detention orders for persons who have come in contact with infected persons, as it is almost always impossible to exclude a contact as being infected until the maximum incubation period has passed. In addition, there must be legislative provision for a person to be detained, regardless of whether or not the person can receive treatment for the disease.

Emergency provisions such as quarantine must be used only when strictly necessary and should be balanced with individual rights in order to avoid impinging unnecessarily on privacy or causing human rights violations. Public health measures such as quarantine are a serious infringement on the individual, and may compromise an individual's financial well-being – such measures should be accompanied by national support for the individual so as to not be an active disincentive for compliance.

Allocation of funding

In South Australia, most public health infrastructure is provided through local government. Adequate resourcing of local government is necessary if it is to fulfil its responsibilities vis-à-vis public health and, in particular, in order to ensure that health planning, implementation, and biennial reporting are carried out.

When additional public health tasks are allocated, they must be accompanied by an additional budget. In Australia, the Financial Framework (Supplementary Powers) Regulations 1997 provide specific funding for health emergency planning and response, including IHR core capacities; the clear allocation of this expenditure provides a strong basis for IHR implementation activities.

In Finland, budget cuts have led to a reduction in activities focused on antimicrobial resistance, as well as challenges in retaining the country's laboratory workforce and in maintaining reference laboratories.

Defining roles and required expertise

In Canada, the Chief Medical Officers of Health (also known as Chief Public Health Officer, Provincial Health Officer and National Public Health Director in difference provinces) at federal level and in each province or territory have responsibility for the protection and promotion of the health of the public and the prevention of disease and injury. However, the power and authority of the federal and

provincial Chief Medical Officers of Health is not clearly defined in legislation, leading to confusion and conflict.

In South Australia, the role of Chief Medical Officer and Chief Public Health Officer is currently a combined position. Many submissions to the review of the South Australian Public Health Act 2011 found that the Chief Public Health Officer should be a dedicated full-time position, distinct from the Chief Medical Officer, so as to ensure that public health receives the focus and resources needed to guarantee community health outcomes. In addition, several submissions noted that the Chief Public Health Officer should be required to demonstrate public health or environmental health expertise, qualifications, and experience.

Additionally, the roles of public health partner authorities and local councils in South Australia should be more clearly defined in legislation, both in order to avoid confusion and in order to ensure that partnerships are operating as intended. Local councils may not have the time or expertise to promote public health messaging, particularly on prevention. Leaving the task of prevention messaging to local councils has led to gaps in the provision of such messaging across different councils. In NSW, the 2016 review of the Public Health Act 2010 found that a certain degree of freedom in how roles should be fulfilled was needed so that local authorities could use local knowledge to greater effect.

Working across legislative and organisational boundaries

The theme 'working across legislative and organisational boundaries' resulted in the most lessons learned.

A central requirement of the WHO IHR 2005 is that countries have a national focal point, and in federated countries, there should still be just one national focal point. During the 2009 H1N1 pandemic, there was a lack of coordinated information sharing across state boundaries in Australia, and this impeded efforts to stop the spread of the virus. There should be a coordinated IHR notification framework between the different states in federated countries. Jurisdictional clarity should be addressed when developing or amending public health laws in order to ensure that there are clear and transparent lines of responsibility and reporting.

Legislative barriers to information sharing can impact the timeliness, flexibility, and quality of international reporting under the IHR. In Canada, no formal process exists for the interjurisdictional sharing of data, and the system is currently reliant on informal collegial relationships between provinces and territories. Gaps in the pan-Canadian legal foundation have the potential to undermine the capacity to detect public health events affecting multiple jurisdictions. In Australia, there is a need for legislation to facilitate the sharing of information between agencies, as the country's federated political system is a barrier to the use of data linkages to improve completeness of items in the National Notifiable Diseases Surveillance System.

In Scotland, there was reported variation in local health protection arrangements between health boards, leading to non-standardised approaches to health protection across the country. In Australia, a submission to the review of the South Australian Public Health Act 2011 suggested that prescribed templates, guidance documents, and information circulars could be used to ensure consistency in information sharing and core documents across states.

Conversely, two studies found that decentralised healthcare systems have certain advantages when responding to public health emergencies. A study in Australia found that a decentralised system can allow for more effective distribution of resources and shorter lines of communication in response to emergencies. A study in Scotland also found that devolved administrations working closely together can enhance the effectiveness of responses to pandemics.

In the Netherlands, the National Institute for Public Health and the Environment is, among others, responsible for the coordination and provision of information to patients and professionals during infectious disease outbreaks. The National Institute for Public Health and the Environment is part of an outbreak management team, and institute representatives attend managerial coordination meetings. Likewise, the creation of the Public Health Agency of Canada strengthened federal leadership and capacity in public health, both in preparedness and in response to health emergencies.

Public trust

In a review of the Public Health Act 2010, the NSW Government indicated that while public health orders are necessary in limited cases to protect public health, they also represent an infringement of liberty, and the NSW Ministry of Health should be transparent in relation to the numbers of such orders made.

Two studies highlighted the importance of community engagement; for example, in Australia it was reported that engagement with affected communities, such as those with Human Immunodeficiency Virus (HIV), builds trust and community confidence in the government.

In Australia, it was also demonstrated that community confidence can be retained by showing regard for the civil rights of citizens. In 2016, the NSW Government reported that protection from subpoena is important for all information held under the Public Health Act 2010 in order to ensure that people are satisfied that their data are being used only for public health purposes. An international study also found that clarification of what information can be collected, and how the privacy of that information will be safeguarded, is an important aspect of maintaining public trust in public health.

Recognising the disadvantages placed on individuals through public health safety measures such as quarantine was also important to gaining public trust. In Australia, it was found that an appropriate duration of emergency powers holds public confidence in an emergency. Also, in Australia, it was reported that introducing compensation measures into pandemic plans would increase trust in government and public health institutions.

Conclusions

Legislation implementing the IHR demonstrated a focus on measures for disease control and treatment, and also demonstrated some diversity in implementation strategies, despite the unifying element of the IHR core capacities. Lessons learned from the implementation, such as the importance of cross-boundary cooperation, can only be tested by major disease outbreaks. The WHO recommends performing preparedness exercises in order to overcome this limitation.

1 Introduction

1.1 Policy background

Legislation and policy have been implemented in Ireland to adopt the requirements of the International Health Regulations (IHR) 2005 and associated European Parliament decisions. Despite these measures, the Communicable Disease Control Policy Unit of the Department of Health (DOH) has highlighted the need to update Irish public health legislation and policy in order to strengthen measures for disease control and response. This strengthening is necessary in order to fully modernise the Irish approach to public health. Furthermore, the potential impact of Brexit on border control should be addressed in order to ensure continued cooperation in the event of international health incidents, such as disease outbreaks and pandemics. The new public health framework being proposed seeks to address the recommendations contained in the 2018 *Crowe Horwath Report on the Role, Training and Career Structures of Public Health Physicians in Ireland,* which suggested that the Health Service Executive (HSE) place public health at the centre of health services in Ireland, providing leadership for the proposed hub-and-spoke model of organisation.[1]

Infectious disease policy and legislation should address infrastructural arrangements relating to the emergence and spread of disease-causing agents. Such arrangements would include governance structures, monitoring and reporting of disease incidence, surveillance for new or emerging diseases, and planning for public health emergencies. The proposed new public health framework will address this in an adaptable yet robust manner and will act as a direction for future developments in infectious disease policy and legislation, as monitored by the HSE. In addition, the framework should support the continuation of an Irish contribution to European Union (EU) and World Health Organization (WHO) health protection policy development.

The Communicable Disease Control Policy Unit of the DOH is developing a new policy framework for public health services, encompassing infectious diseases. This framework will put in place measures to assist the eventual updating of Irish legislation in relation to infectious diseases. Updated legislation is necessary in order to modernise the response to outbreaks of newly emerging diseases and to antibiotic resistance in disease-causing microorganisms.

Infectious diseases are those which are communicable in nature and can be spread from person to person through physical proximity or via a vector, such as mosquitoes or livestock, or transmitted from innate (e.g. Legionella) or environmental (e.g. food – E. Coli) sources. The proliferation of trade routes and an increase in the accessibility of travel has led to the increased transmission potential of infectious diseases, whereby disease-causing microorganisms can be unintentionally transported across the globe at a higher rate than ever before.[2] Furthermore, an increase in urban density worldwide, particularly in developing countries, has resulted in more people than ever living in close proximity to one another. Bioterrorism threats are also a concern. The likelihood of emergence of a novel infectious disease has therefore increased in recent years, particularly in developing countries where people and livestock share close quarters.[2] For these reasons, vigilance is key and there should be an international system in place for coordinating responses to infectious disease events of public health significance.

The IHR is a set of guidelines devised by the WHO in order to coordinate the global response to infectious disease emergencies. First introduced in 1969 to cover six common diseases of the time (including cholera and polio), the guidelines were revised in 2005 following the 2003 SARS outbreak.[3] These revisions adapted the IHR for the modern era and expanded their scope to make provisions for future outbreaks of unknown aetiology. The new revisions are binding on all state parties, which includes the 194 member states of the WHO plus Liechtenstein and the Holy See.[3] In order to adopt the IHR, the so-called core capacities must be written into legislation, either through new or replacement legislation or through amendments to existing acts. The IHR came into force in 2007, with a deadline for implementation by 2015; however, as of 2017, only 70% of the required attributes for the IHR had been implemented globally.[4] The core capacities of the IHR are outlined in Section 2.6.1

In Ireland, legislation dealing with infectious diseases includes the Health Act, 1947, and the Infectious Diseases Regulations 1981.[5,6] Further regulations, such as the Infectious Disease (Aircraft)

Regulations 2009 and the Infectious Disease (Shipping) Regulations 2008, were introduced in order to address the core capacities of the IHR.[7,8] At the moment, the DOH is interested in updating public health legislation to consolidate these regulations, and to develop a new policy framework for public health services encompassing infectious diseases.

In order to do this, the DOH has signalled the need to first investigate what legislation other WHO state parties have used to adopt the IHR, and second, to identify any lessons learned from the implementation process. Knowledge of any lessons learned will help to identify gaps in, or creative approaches to, implementation.

1.2 Purpose

The purpose of this evidence review The Evidence Review will feed into the business case to be made to the DOH policy committee for the development and implementation of the proposed framework on public health and infectious/communicable diseases. The review will act as a key source of information to assist public consultation sessions, to facilitate stakeholder engagement in policy development, and to inform policy options aimed at resource allocation and the drafting of new public health legislation.

1.3 Research questions

In order to fulfil these objectives, the DOH has proposed that this review should answer the following research questions:

1. What new or replacement overarching public health legislation, including communicable/infectious disease legislation, have countries introduced since the IHR 2005? (State or provincial level legislation to be included in Federal countries)
2. What were the lessons learned from the national experience of introducing new overarching legislation for public health, including communicable/infectious diseases? (State or provincial level legislation to be included in Federal countries)

These questions will be addressed using systematic review methods, as described in Section 2 of this report.

2 Methods

The search method used for this review followed a standard systematic methodology. Published research on the topics outlined in the review questions was sourced using bibliographic databases, and non-peer-reviewed material was explored using searches of websites for grey literature. The same searches were used for Question 1 and Question 2. Supplemental searches were carried out by the researchers. The results for all searches were screened by the researchers, and reduced to a core set of results that could speak to the review questions.

2.1 Eligibility criteria

2.1.1 Question 1

The aim of Question 1 was to identify any overarching public health legislation, or descriptions of legislation, that has been introduced in order to implement the core capacities of the IHR since its revision in 2005. Eligibility for inclusion of legislative instruments in this review was determined by the criteria outlined in Table 1. Overarching public health acts, amendments made to these acts and regulations made under the acts were eligible for inclusion.

Table 1 Eligibility criteria for Question 1 legislation overview

Domain	Inclusion criteria	Exclusion criteria
Population	General population	Disease-specific populations
Intervention	Overarching legislation for communicable/infectious disease management akin to the remit of IHR 2005	
Setting	National legislation	
Outcomes	As described in Section 2.6	
Study design	Overarching act Regulation made under an act Amendments made to the overarching act Descriptions of legislation/regulations	Strategy documents
Countries	As outlined in Section 2.2	
Date	May 2005–July 2019	Pre- May 2005
Language	Legislation in English or with an English-language translation available	

2.1.2 Question 2

The aim of Question 2 was to review the lessons learned from the selected countries' national experiences of incorporating the IHR into national legislation, with a particular focus on infectious diseases as per Irish policy requirements. Eligibility for inclusion of papers in this review was determined by the criteria outlined in Table 2. In order to answer this question, we used the International Labour Organization's definition of a lesson learned:[9(p2)]

> A lesson learned is an observation from project or programme experience which can be translated into relevant, beneficial knowledge by establishing clear causal factors and effects. It focuses on a specific design, activity, process or decision and may provide either positive or negative insights on operational effectiveness and efficiency, impact on the achievement of outcomes, or influence on sustainability. The lesson should indicate, where possible, how it contributes to 1) reducing or eliminating deficiencies; or 2) building successful and sustainable practice and performance.

Table 2 Eligibility criteria for review of lessons learned

Domain	Inclusion criteria	Exclusion criteria
Population	National, state, or provincial level	Smaller geographic subpopulation
Intervention	Overarching legislation for communicable/infectious disease management akin to the remit of IHR 2005	Amendment legalisation or regulations made under older legislation
Outcomes	Studies that identify lessons learned, strategies, challenges, or contextual factors to implementing or transitioning to new overarching public health legislation	Studies that do not identify these outcomes
Study design	Any primary research design, including case studies, evaluations, and qualitative studies	Conceptual/theoretical papers, conference proceedings, theses
Location	Countries identified in Question 1	
Date	May 2005–July 2019	Pre- May 2005

2.2 Included countries

The countries included as relevant to this review were based on indications by the DOH and had to have updated their public health or infectious disease legislation since the IHR was revised in 2005. EU member states were of interest due to geographic similarities and relationship with the European Centre for Disease Prevention and Control (ECDC). Canada and Australia were also of interest due to the availability of data in English.

For inclusion, it was necessary that an English-language version of the legislation be available – either the original document, a translation of it, or an English-language summary. The DOH contacted the ECDC via the Irish Health Protection Surveillance Centre (HPSC) in order to ascertain which countries would be of interest. If countries did not respond via ECDC the HRB also carried out a targeted grey literature search to identify any relevant legislation in EU member states.

The HPSC asked the following questions of the EU member states, via the ECDC:

1. Has your country introduced new or replacement overarching public health legislation or infectious disease legislation since 2005?
2. Is this legislation available in English? (If so, please provide a copy or a link to where a copy can be obtained by email.)
3. If the legislation is not available in English is an English summary available? (If so, please provide a copy or a link to where a copy can be obtained by email.)

Of the 28 EU member states that were contacted, 11 responses were received. Of these 11 responses, 3 countries (Croatia, Finland, and Portugal) were eligible for inclusion based on the criteria outlined above; the other eight responses showed that those countries had not implemented new or replacement overarching public health legislation in the wake of the IHR 2005.

The DOH indicated some English-speaking countries of interest, and of these, Australia, Canada, and Scotland were eligible for review. Relevant legislative instruments from federated countries were also examined at the state/provincial level, and, if eligible, state/provincial public health legislation was analysed alongside federal legislation as well as legislation originating from unitary states.

The Netherlands was identified as eligible for inclusion through the grey literature search outlined in Section 2.3.2. Other jurisdictions believed to have updated or replaced their infectious disease legislation in order to achieve IHR compliance included Poland, five states in Australia (New South Wales (NSW), Queensland, South Australia, Victoria, and Western Australia), and three provinces in Canada (British Columbia, Manitoba, and Newfoundland and Labrador).

The Australian state of Queensland was excluded following the literature search because overarching public health legislation was introduced in that state in March 2005 just prior to the publication of the IHR by the WHO in May 2005. Poland, while eligible for the review due to the publication of new overarching infectious disease legislation, was excluded following the literature search because a suitable English translation of the act, or description of the act, could not be sourced.

In total, seven countries (Australia, Canada, Croatia, Finland, the Netherlands, Portugal, and Scotland), four Australian states (NSW, South Australia, Victoria, and Western Australia), and three Canadian provinces (British Columbia, Manitoba, and Newfoundland and Labrador) were included in this review.

2.3 Information sources

2.3.1 Database searches

Literature searches, including bibliographic databases and searching of websites for grey literature, were carried out by an information specialist (CL). Biomedical and legal bibliographic databases were selected in order to maximise the likelihood of capturing relevant material. The biomedical databases used were Ovid MEDLINE, Scopus, and Web of Science, while the legal databases searched were HeinOnline and LegalTrac.

While it was noted in the review protocol that Embase would be used, test searches carried out indicated that the range of databases included in the Web of Science search platform (see Appendix B) appeared to capture a useful and relevant range of results. As time did not permit both databases to be used, Web of Science was chosen over Embase by the information specialist. Ovid MEDLINE was chosen over PubMed due to the flexibility of its search interface. While there are differences in search capture between the various MEDLINE platforms, it was considered that one platform would be sufficient given the time available.[10] The legal database LegalTrac and the legal platform HeinOnline were included because the topic of the review involved legislation.

Given the range of countries to be included in the review, the searches were divided into two sets. A comprehensive search strategy was initially tested on 30 July 2019 with Ovid MEDLINE using search terms relating to public health/infection control, legislation, and two selected countries: Finland, and Scotland. The search strategy was translated for use in the other databases, but search terminology was kept as consistent as possible, given the different search interfaces and indexing involved. Searches for all five databases/platforms were carried out for Scotland and Finland between 30 and 31 August 2019.

Database searches using the same databases were subsequently carried out in mid-August 2019 for the second set of included countries, states, and provinces: Australia (NSW, Queensland, South Australia, Victoria, and Western Australia), Canada (British Columbia, Manitoba, and Newfoundland and Labrador), Croatia, the Netherlands, Poland, and Portugal. Complete search strategies for Ovid MEDLINE are available in Appendix B, and the other search strategies are available on request.

2.3.2 Grey literature

Searches were carried out on governmental and other relevant websites (see Appendix B for a full list of the websites searched) for the two sets of countries. Searches were also carried out in Google and Google Scholar using targeted terminology.

Grey literature searches were carried on websites considered to be relevant to public health/infection control issues (i.e. Government Departments/Ministries of Health, national legal reform committees, and public health organisations of the relevant country). Websites searched are listed in Appendix B. Searches were also carried out in the search engines Google and Google Scholar[11] in order to supplement the website searches, using an examination of the first 100 results for relevant research. Firefox was the browser used, and results were downloaded to the bibliographic management system Zotero for ease of use. While this method has severe limitations[12] – including the 'black box' nature of the algorithms used to sort search results in Google products, as well as the likelihood of relevant results also occurring much deeper in the search than in the top 100 results – it did capture some potentially relevant results in this case. From each batch of the top 100 results, potentially relevant results were screened by the information specialist using the inclusion criteria and were transferred to an EndNote library for examination by the researchers.

Results were compiled in an EndNote file (EndNote version X9.2) and deduplicated. Screening of the results was carried out in EndNote by experienced researchers (JQ, MW).

References from systematic reviews identified in the search were chased in order to identify any additional primary studies.[13-16]

2.3.3 Search limits

In order to be included in this review, papers had to be published in May 2005 or onwards, i.e. after the introduction of the IHR in May 2005. Included results were also limited to papers published in the English language, or to those for which an adequate translation was available.

2.4 Search strategies

Search terms used were based on descriptive variants for the concepts of legislation/policy/regulations (for example, legislation.pt OR exp Legislation as Topic/OR Communicable Disease Control/lj) and public health/communicable disease/infectious disease (for example, exp Global Health/OR communicable disease$.mp.OR public health emergenc*.ab,ti.). These concepts were combined and search terms for the relevant countries were added. A date limit of 2005 to present was used. After testing, it was found that an English-language filter did not remove significant numbers of results, as much of the material was in English already; therefore, such a filter was not used. It was not possible as part of this review to have the strategies peer reviewed by another librarian, due to lack of available resources. However, the information specialist used elements of the PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement to assist in developing the searches.[17]

Search strategies for all the included countries for Ovid MEDLINE are provided in Appendix B. Search strategies for the other four databases used were similar and are available on request. Website searches for each country are also included in Appendix B, as are the numbers of results for each country and database, and for Google and Google Scholar searches.

2.5 Study selection

Abstracts for review were downloaded into EndNote version X9.2, which was used to manage references at all stages of the evidence review. The abstracts were reviewed against the eligibility criteria for both questions, as carried out by two independent researchers (JQ and MW). Any ineligible abstracts were excluded and the reason for exclusion was noted. Full papers identified by the initial searches were also screened independently by two systematic reviewers. Any disagreements were discussed before a consensus was reached. A PRISMA diagram was constructed for the review, and excluded publications were tabulated alongside the reason for exclusion.

2.6 Data extraction and validation

Data for each question were extracted into a bespoke extraction sheet in Microsoft Excel by a single reviewer (MW for Q1, JQ for Q2). All sections of the eligible public health legislation were extracted, with the exception of definitions and short titles. Full papers were checked for supplementary data and errata prior to data extraction. Extracted data for Question 2 were verified independently by a second reviewer against a clean copy of the publication (MW or TM).

2.6.1 Question 1

The outcome variables for extraction are outlined in Table 3. These outcomes are of interest to the DOH and the HSE, and cover the public health capacities outlined in the IHR 2005. The extraction variables were piloted for results from Scotland and Finland, and the results of this pilot extraction were used to inform the final approach followed. The original categories of legislation for extraction requested by the DOH are given in Appendix A, as well as their relationship to final outcome variables used for extraction.

The IHR core capacities and components are key criteria which must be addressed in national legislation in order to fully implement the revised IHR. These were adapted to form seven of the variables for extraction. The core capacities and components are as follows:[18]

- Core capacity 1: National legislation, policy and financing
  - Component 1A: National legislation and policy
  - Component 1B: Financing
- Core capacity 2: Coordination and national focal point communications
  - Component 2A: IHR coordination, communication and advocacy
- Core capacity 3: Surveillance
  - Component 3A: Indicator-based surveillance
  - Component 3B: Event-based surveillance
- Core capacity 4: Response
  - Component 4A: Rapid response capacity
  - Component 4B: Case management
  - Component 4C: Infection control
  - Component 4D: Disinfection, decontamination and vector control
- Core capacity 5: Preparedness
  - Component 5A: Public health emergency preparedness and response
  - Component 5B: Risk and resource management for IHR preparedness
- Core capacity 6: Risk communication
  - Component 6A: Policy and procedures for public communications
- Core capacity 7: Human resources
  - Component 7A: Human resource capacity
- Core capacity 8: Laboratory
  - Component 8A: Policy and coordination of laboratory services
  - Component 8B: Laboratory diagnostic and confirmation capacity
  - Component 8C: Laboratory biosafety and laboratory biosecurity

- Component 8D: Laboratory-based surveillance

These core capacities were incorporated into the extraction variables (framework components) for comparison. The remainder of the variables for extraction were based on recommendations from the DOH in order to satisfy Irish policy needs, as well as potential needs that emerged from pilot extraction of the legalisation. These included:

- Vaccination
- Appeals and liabilities, and
- Mortuaries and dead bodies.

Lastly, sections pertaining to the administration of the legislation were extracted for clarity purposes, although these were not included in the final analysis. Sections whereby the content did not align with any of the extraction variables were assigned to the category 'other'. These remaining variables for extraction were:

- Enactment date
- Repealed or amended legislation
- Objectives
- Scope, and
- Other (unmapped).

Data were also collected on the countries' demographics for comparison and country selection purposes. The demography variables for extraction included:

- Description of the state/province or country
- Current population (total and profile), and
- Age breakdown.

For the purposes of this review, the outcome variables are referred to as 'categories'.

The following is a summary of the data extraction and validation for Question 1. With the exception of definitions, all sections of the acts and regulations were extracted into an Excel spreadsheet. The sections were mapped to the most closely aligned category based on content. Mapped sections were counted, in order to determine the percentage of each country's public health legislation devoted to each category.

Table 3 Legislative categories for extraction

Category	IHR core capacity	Description
Control and treatment	Response (4)	Measures to prevent the spread of infectious diseases, including examinations, quarantine, and mandatory treatment.
Surveillance and notification	Coordination and national focal point communications; surveillance (2 and 3)	Communications between healthcare professionals or organisations about infection cases or outbreaks. Generally refers to notifiable diseases which are country specific, or to unusual numbers of newly emerging diseases.
Emergency preparedness and prevention	Preparedness; risk communication (5 and 6)	Measures to prevent the occurrence of a public health risk, and to plan for contingencies in the event of an emergency. This includes cross-border control and port security.
Officers and designated offices	Coordination and national focal point communications (2)	Structure of public health organisation chart, roles and responsibilities of officers, and establishment of a National Focal Point.
Ministerial and political interface	National legislation, policy and financing (1)	Regulation-making powers and the role of the Minister for Health or equivalent
Laboratory	Laboratory (8)	Responsibilities of laboratories and designation of national reference laboratories.
Resources	National legislation, policy and financing; human resources (1 and 7)	Funding, facilities, IT systems and software, technology, procurement and audit, and human resources.
Vaccination	N/A	All references to immunisation, seroprophylaxis, and chemoprophylaxis.
Mortuaries and dead bodies	N/A	Provisions for storing and handling dead bodies.
Appeals and liabilities	N/A	General measures for appealing decisions made under the legislation, and sanctions for non-compliance.
Other	N/A	Sections not aligning to the extraction variables.

Number in parentheses is IHR core capacity number

2.6.2 Question 2

The following variables were extracted:

- Author and year
- Study design
- Country

- Lessons learned elements, as outlined in the International Labour Organization guidance:
  - Brief description of lesson learned (link to specific action or task)
  - Context and any related preconditions
  - Targeted users/beneficiaries
  - Challenges/negative lessons – causal factors, and
  - Success/positive issues – causal factors.

2.7 Quality assessment

We did not critically appraise any of the references included for Question 1, as these are all legislative instruments and critical appraisal of such documents would not be appropriate.

For Question 2, we selected the Mixed Methods Appraisal Tool (MMAT).[19] We selected the MMAT designed for the appraisal stage of systematic reviews that include mixed methods studies, i.e. reviews that include qualitative, quantitative, and mixed methods studies. The MMAT was only used to appraise the quality of empirical studies; non-empirical studies were not critically appraised, as no suitable appraisal tool was identified. The quality appraisal was carried out independently by two reviewers (JQ and TM) and any differences were resolved by discussion.

2.8 Synthesis

2.8.1 Question 1: legislative overview

The categories described in Table 3 were devised in order to guide our analysis of the national public health legislation. These categories were adapted from the IHR core capacities and based on recommendations from the DOH. While previous studies[20,21] have applied the IHR core capacities directly for the purposes of comparative analyses, the Irish context required an examination of broader communicable disease requirements, such as vaccination and appeals processes. Further categories were included for sections relating to the general administration of the acts which were extracted but not included in the analysis. The legislation was mapped to the categories based on the content of each section, and the number of sections mapped to each category was calculated. These counts were used to represent the percentage of each country's public health legislation devoted to each category. The categories forming the components of this analysis are listed in Table 3.

2.8.2 Question 2: synthesis

Identified studies and lessons learned were synthesised using a thematic qualitative approach.[22] Studies included in this question used both qualitative and quantitative designs. The thematic analysis was conducted by JQ. After data familiarisation, concepts were coded based on their explicit content. Themes were then identified from the data by grouping common concepts. Once completed, themes were reviewed and defined. This became an iterative process, including input from TM and MW, until the themes were finalised. The researchers used an inductive approach to thematic analysis, which is driven by the data rather than trying to fit it into a pre-existing coding frame or relying on the researcher's analytic preconceptions.[23] In this approach the themes identified are strongly linked to the underlying data and may bear little relation to the specific questions that were asked of the participant. This qualitative synthesis achieves the goal of transparency by relying on the data themselves.[24]

3 Question 1 findings: legislation

Question 1: What new or replacement overarching public health legislation, including communicable/infectious disease legislation, have countries introduced since the IHR 2005? (State or provincial level legislation to be included in Federal countries)

3.1 Search results

A total of 12 legislative instruments were identified via the 11 responses received from the ECDC. A total of 48 legislative instruments were identified by both grey literature searches and by DOH recommendations. Following assessment of eligibility, 11 of these 60 legislative instruments were excluded, yielding a total of 49 included legislative instruments. A PRISMA diagram of this process can be seen below at Figure 1.

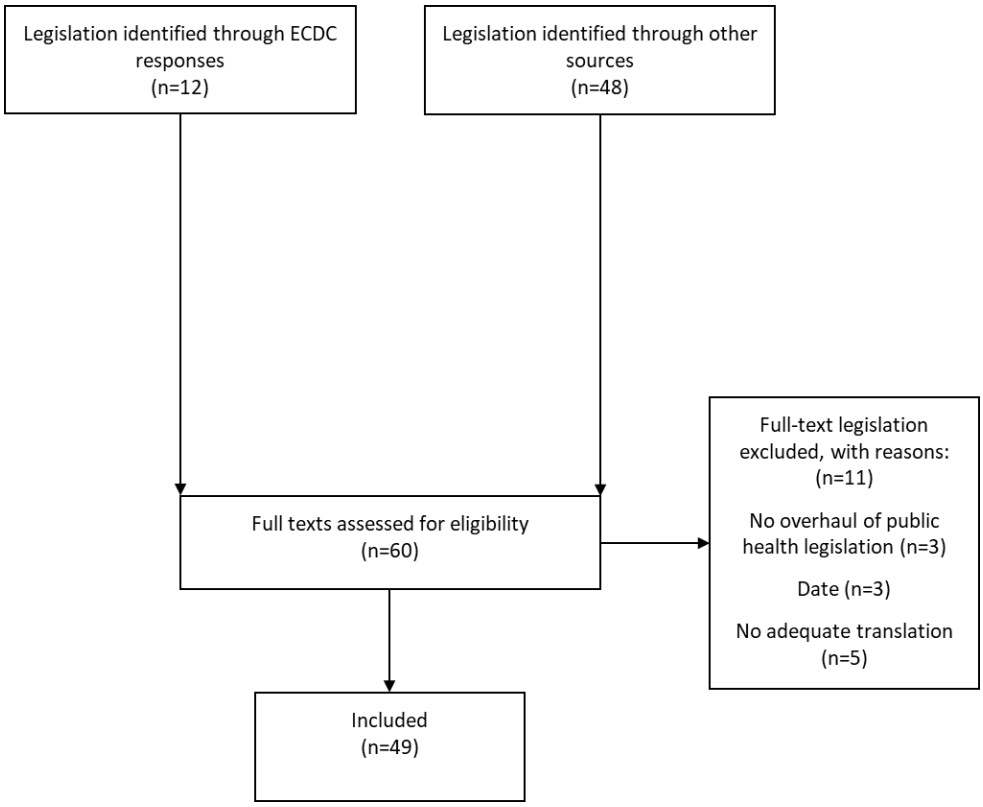

Figure 1 PRISMA diagram for Question 1

3.2 Included countries and legislation

The legislation pertaining to public health and infectious diseases was studied for seven countries, which included five European unitary states as well as two federal countries, Canada and Australia, and their eligible states/provinces. Following revision of the IHR in 2005, which came into force on 15 June 2007, all WHO state parties were expected to update their legislation in order to ensure compliance with these regulations. The following sections describe the countries and states/provinces included in this review. They also list the legislative instruments identified by our search and gives a brief overview of the public health structure outlined by these legislative instruments.

3.2.1 Australia

Australia is a federal country comprising six states and two territories. Under this federal system, states and territories have primary responsibility for health care related matters and emergency management.[25] The federal government provides funding, policy management, and coordination in the context of national responses to public health emergencies. It also has quarantine powers and powers related to border management that can be used where there is an epidemic or threat of an

epidemic. Cooperative and collaborative devices between these levels of government are needed for the strategic coordination of responses to public health emergencies. [25]

For the purpose of this review, federal Australia and four Australian states – NSW, South Australia, Victoria, and Western Australia – were eligible for study.

The federal legislation we found that was introduced in order to implement the IHR 2005 and manage infectious disease risk comprised the National Health Security Act 2007, the National Health Security Regulations 2018, the Biosecurity Act 2015, and the Biosecurity (Human Health) Regulation 2016.[26-29]

The organisation of Australia's public health system is laid out at federal and state level. The national focal point is established by the National Health Security Act 2007, and acts as the central disease communication hub for all of Australia.[26] The national focal point liaises with the WHO and its state parties for the purposes of giving effect to the IHR. The Minister for Health may delegate powers to a State Emergency Service employee of the Department of Health. Under the Biosecurity Act 2015, a biosecurity officer, human biosecurity officer, or chief human biosecurity officer may give direction to carry out functions under the act.[28] Furthermore, the Director of Human Biosecurity may determine which diseases should be made notifiable.

3.2.1.1 New South Wales

A new overarching public health act, the Public Health Act 2010, was introduced to implement the requirements of the IHR 2005.[30]

In NSW, the Chief Health Officer has the overarching responsibility for public health at the state level and may delegate their powers (except for the power to delegate powers) to any authorised person. Public health officers have the function of furnishing reports to the Secretary of the Department of Health on public health matters, coordinating the authorised officers, and exercising functions under the direction of the Secretary.[30]

3.2.1.2 South Australia

The South Australian Public Health Act was introduced in 2011,[31] and we found seven regulations under the Act. These include the South Australian Public Health (Fees) Regulations 2018 (ceased) and 2019, the South Australian Public Health (General) Regulations 2013, the South Australian Public Health (Legionella) Regulations 2013, the South Australian Public Health (Notifiable and Controlled Notifiable Conditions) Regulations 2012, and the South Australian Public Health (Wastewater) Regulations 2013.[32-36] Further regulations under the Act pertaining to the screening of cervical and related cancers were found but were not included in this review, as the topic was outside the scope of the review.

The South Australian Public Health Council is the body responsible for promotion and protection of public health. The Council consists of a Chief Public Health Officer ex officio and nine other members who are appointed by the Governor on nomination by the Minister of Health. The Chief Public Health Officer position should be filled by a person with qualifications in the field of public health, who may be a member of the public service. As per the South Australian Public Health Act 2011, regulations made under the Act must be reviewed every 5 years.[31]

3.2.1.3 Victoria

Victoria's infectious disease legislation was updated through the Public Health and Wellbeing Act 2008, and the subsequent Public Health and Wellbeing Regulations 2009.[37,38] Two further acts describing the state's response to emergencies were found, but were determined to be outside the scope of this review due to a lack of focus on public health matters.

As the foremost authority under the Public Health and Wellbeing Act 2008, the Chief Health Officer oversees public health matters.[37]

3.2.1.4 Western Australia

The state's Public Health Act was introduced in 2016,[39] and the Public Health Regulations 2017 made under this Act have yet to fully come into force.[40] These legislative instruments supplemented the

Mandatory Testing (Infectious Diseases) Act 2014, which began implementing the IHR core capacities pertaining to disease control and treatment.[41]

Similar to other Australian states, the Chief Health Officer of Western Australia oversees functions in the administration of the Public Health Act 2016.[39]

3.2.2 Canada

Canada is a federal country comprising 10 provinces and 3 territories. Federal Canada and three Canadian provinces – British Columbia, Manitoba, and Newfoundland and Labrador – were eligible for this review. The federal legislation implementing the requirements of the IHR 2005 comprises the 2005 Quarantine Act, the 2006 Quarantine Regulations, the 2006 Public Health Agency of Canada Act, and the 2007 Emergency Management Act.[42-45] The federal government's power to issue a declaration of a public welfare emergency can only be triggered after a relatively high threshold is met; that is when the direct effects of the emergency are felt across more than one province.[46] Therefore, In Canada, most public health emergencies are dealt with at the municipal and provincial level in coordination with the federal government.

In Canada, the Chief Public Health Officer is the lead health professional for public health matters, and this role is appointed by the Governor in Council.[44]

3.2.2.1 British Columbia

The Public Health Act implementing IHR measures was introduced in 2008.[47] Through this review, we found seven regulations made under the Act. These are the Reporting Information Affecting Public Health Regulation, the Code of Practice for Soil Amendments, the Health Hazards Regulation, the Information Regulation, the Public Health Impediments Regulation, the Public Health Inspections and Orders Regulation, and the Vaccination Status Reporting Regulation.[48-54]

Under the Public Health Act, public health is organised at provincial level by medical health officers, who act under the direction of the Minister of Health. Qualified persons appointed as medical health officers may exercise powers under the Act in the geographic area of British Columbia.[47]

3.2.2.2 Manitoba

The Public Health Act came into effect in 2009.[44] Under the Act, the Minister of Health, Seniors and Active Living may give direction to regional health authorities. The Minister may appoint one or more officers to carry out functions under the Act, and the Chief Public Health Officer is the local authorised person for public health matters. We found seven regulations in force under the Act which were eligible for inclusion in this review. These include the Reporting of Diseases and Conditions Regulation, the Dead Bodies Regulation, the Disease Control Regulation, the Health Hazards Regulation, the Immunization Regulation, the Information Sharing Regulation, and the Public Health Personnel Regulation; all of these were enacted in 2009.[55-61]

3.2.2.3 Newfoundland and Labrador

We found two legislative instruments pertaining to IHR implementation in Newfoundland and Labrador, which were the Public Health Protection and Promotion Act and the regulations made under this Act.[62,63] Under the Public Health Protection and Promotion Act, the Minister of Health and Community Services shall appoint a medical practitioner to the post of Chief Medical Officer of Health.[62]

3.2.3 Croatia

Croatia is a European unitary state, formerly part of the Eastern bloc country of Yugoslavia. The IHR was adopted into legislation in 2007 through the Act on the Protection of the Population Against Communicable Diseases[64] (*Zakon o Zaštiti pučanstva od zaraznih bolesti*). The responsibility for creating and implementing measures aimed at protecting against communicable diseases is given to the Minister of Health, on advice from the Croatian National Institute of Public Health. Any person employed for the purposes of carrying out functions under the Act will be appointed by the Minister.[64]

3.2.4 Finland

Finland is a European unitary state and adopted the IHR into legislation through the Communicable Diseases Act[65] (*Tartuntatautilaki*). We identified two regulations made under this Act: the Government Decree on communicable diseases, and the Decree of the Ministry of Social Affairs and Health on vaccinations.[66,67] A legislative act had previously been introduced in 2007 to begin IHR implementation and establish the national focal point, but this has not been translated into English and therefore could not be included in this review. In Finland, the Ministry of Social Affairs and Health ensures the implementation of health information programmes and functions for communicable disease prevention. The Finnish Institute for Health and Welfare monitors disease prevention carries out functions as prescribed by the Ministry of Social Affairs and Health, and proposes new measures for protecting the public against infectious diseases. Regional authorities and municipalities carry out these functions locally.[66]

3.2.5 The Netherlands

The Netherlands is a European unitary state and implemented the IHR 2005 through the 2008 Public Health Act (*Wet Publieke gezondheid*).[68] Subsequently, regulations were introduced later in 2008 in the Decree of 27 October 2008, laying down new requirements regarding public health matters (Public Health Decree).[69] The 2008 Public Health Act defines two bodies at the head of the organisational structure, with the Ministry of Health, Welfare and Sport overseeing the funding and regulation of municipalities, and the National Institute for Public Health and the Environment providing expertise for the development of community health services.[68]

3.2.6 Portugal

Portugal is a European unitary state and implemented the IHR through two means: first, through publishing the text of the IHR 2005 in the Official Gazette of Portugal as Notice No. 12/2008 of 3 January 2008 of the Ministry of Foreign Affairs,[70] and second, through the introduction of Law No. 81/2009 of August 21.[71] Only the latter was extracted for the purposes of this review. Infectious disease surveillance and management of public health matters is carried out by local governments under the direction of the National Health Service.[71]

3.2.7 Scotland

Scotland is a *de jure* unitary state, whereby most of the legislation-making power is devolved from the United Kingdom (UK) and powers are held by the Scottish Parliament. The UK Parliament retains jurisdiction over certain 'reserved matters' which are specified in the Scotland Act 1998.[72] An overarching public health act, the Public Health etc. (Scotland) Act 2008, was introduced to implement new control measures arising from the revised IHR.[73] Two regulations were made under this Act: the Public Health etc. (Scotland) Act 2008 (Sunbed) Regulations 2009 and the Public Health etc. (Scotland) Act 2008 Designation of Competent Persons Regulations 2009.[74,75] An Act legislating for responses to emergencies, the Civil Contingencies Act 2004, was introduced prior to the IHR revision and was therefore outside of the scope of this review.[76] In Scotland, the Minister for Public Health, Sport, and Wellbeing is the foremost authority for the protection of public health under the Act. The Minister delegates functions to the regional health boards and local authorities, which then designate competent persons for the purposes of exercising the functions granted to them by the Act.[73]

3.3 Categories

In order to perform the legislation overview, all sections of the acts and regulations (except for definitions) were extracted into an Excel spreadsheet. The sections were mapped to the most closely aligned category based on content. Mapped sections were counted, and the percentage of each country's legislation devoted to each category was calculated (Figure 2).

In total, 2,090 sections were extracted from the 49 legislative instruments included in this review. The sections were mapped to the categories (listed in Table 3) based on the nature of the content. The mapped sections were counted and first represented in descending order of abundance, as shown in Figure 3. In order to examine each category by country, the number of sections devoted to the category in each country's legislation was represented as a percentage of the overall number of

sections extracted from that country's legislation. We found that the content of the legislation studied was dominated by measures pertaining to 'control and treatment', with 536 sections, which was followed by the category 'emergency preparedness and prevention', with 335 sections.

In the following sections of this report, we will discuss our analysis of the mapped legislation by category, beginning with the seven categories that align with IHR core capacities as per Table 3 and followed by all other categories. Although legislative sections relating to the administration of the acts (for example, enactment dates and repealed sections) were extracted, these were not included in our analysis.

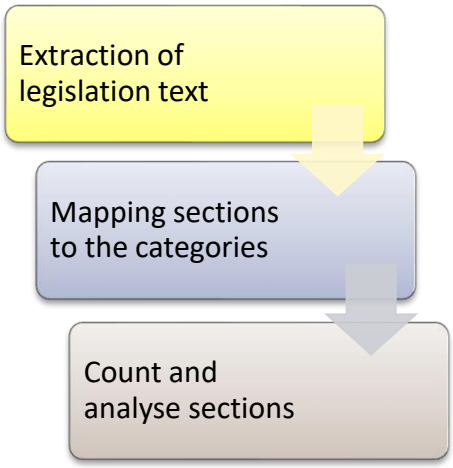

Figure 2 Coding

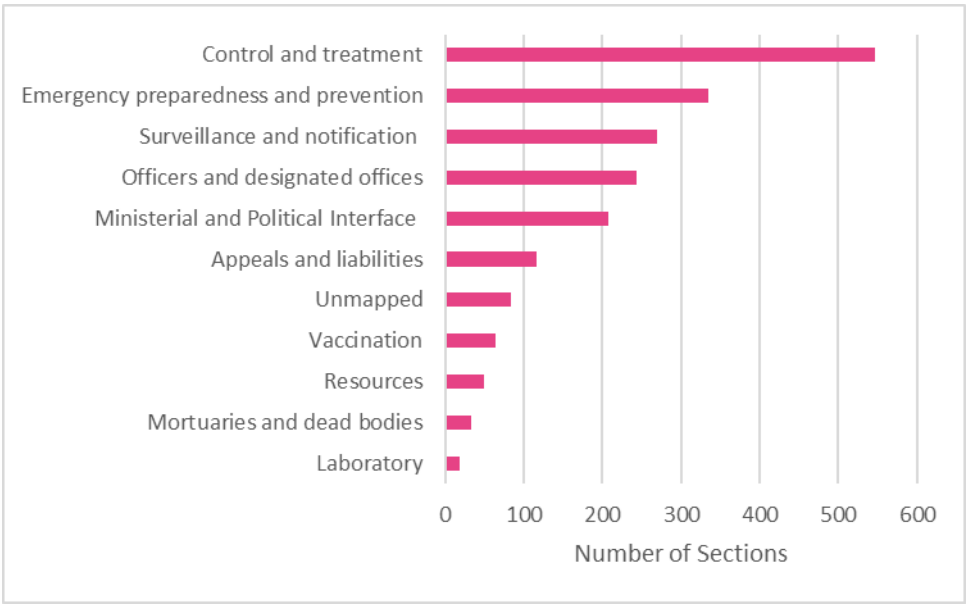

Figure 3 Number of sections mapped to each category

3.3.1 Control and treatment

The category 'control and treatment' deals with measures for halting or preventing the spread of an already existing infectious disease threat, particularly one that poses a particular risk to public health. This category was matched to IHR core capacity 4, 'response', pertaining to a country's efforts to react to a disease threat. The measures in this category apply to all cases of notifiable diseases, unusually large numbers of any infectious disease, or the emergence of a new infectious disease of unknown aetiology. Measures for the control and treatment of infectious diseases include public health investigations, the issuing of public health orders, and the issuing of quarantine orders, as well as mandatory treatment and medical examination of the individual or group of individuals who are suspected to have been exposed.

Control and treatment was found to be the most highly represented category in all of the legislation studied, at 26% overall, with 546 sections in total. We found that these measures were adopted into legislation largely through the overarching public health acts, comprising 502 sections; this is compared with 44 sections originating from regulations. Sections mapped to this category comprised a majority percentage of the Public Health etc. (Scotland) Act 2008, at 55%, with 66 sections in total; this category was the most highly represented category in all the countries studied, as shown in Figure 4.[73]

Conversely, the South Australian Public Health Act 2011 devoted the lowest percentage of its legislation to control and treatment, at just 9.4%.[31,34] However, these measures are covered to a much larger extent in Australia's federal Biosecurity Act 2015 and the National Health Security Act 2007 (48 and 19 sections, respectively).[26,28] The state of Western Australia enacted the Mandatory Testing (Infectious Diseases) Act 2014 prior to the introduction of its Public Health Act 2016, and the 2014 Act is devoted almost entirely to medical examinations for the purposes of disease control and treatment.[41]

Canadian disease control and treatment measures were seen to be evenly distributed across federal and provincial legislation. Manitoba devotes an entire set of regulations under its Public Health Act (the Disease Control Regulation) to this category, although this only contributes 6 sections out of a total of 47 for this province's legislation. In Croatia, employees of various sectors can be subject to mandatory health testing for carriage of microbes such as Methicillin Resistant *Staphylococcus aureus* (MRSA). This applies to healthcare workers, workers in the food industry, and people involved in maintenance of the water supply.[64]

Figure 4 Percentage of legislation devoted to 'control and treatment'

3.3.2 Emergency preparedness and prevention

The category 'emergency preparedness and prevention' was matched to IHR core capacity 5, 'preparedness', which outlines the need to plan for and prevent public health risks from occurring on a widespread scale, as well as core capacity 6 'risk communication,' which deals with the need for rapid and effective communication in the event of an infectious disease emergency of public health concern. Examples of an emergency include pandemic outbreaks of a known infectious disease, emergence of an infectious disease of unknown cause, cross-border spread of a disease-causing microorganism, or contamination of facilities providing essential public services. This category had the second-highest number of mapped sections, at 335, with 241 originating from public health acts and 94 originating from regulations.

Emergency preparedness and prevention measures were most highly represented in federal Australian public health legislation, at 35%, as shown in Figure 5. A total of 50 of these sections originated from the Biosecurity Act 2015; 15 sections originated from the National Health Security Act

2007; 12 sections originated from the Biosecurity (Human Health) Regulation 2016; and 5 sections originated from the National Health Security Regulations 2018.[26-29] At the state level, South Australia contributes 34% of its public health legislation to emergency measures, through multiple regulations.[33,34,36]

Sections mapped to this category are distributed relatively evenly across the European countries, except for Scotland, which only devoted only 2.5% of its Public Health etc. (Scotland) Act 2008, or three sections, to emergency preparedness and prevention measures.[73] This is perhaps due in part to the earlier Civil Contingencies Act 2004, which was introduced prior to the IHR 2005 and was therefore outside of the remit of this review.[76]

Canada's federal Emergency Management Act only devotes two sections in total to emergency preparedness and prevention, although due to the short length of the legislative text, this represents 33.3% of the Act.[45] Despite its name suggesting a focus on emergency preparedness and prevention, the most highly represented category in the Emergency Management Act is actually 'ministerial and political interface', as described in detail in Section 4.3.5.

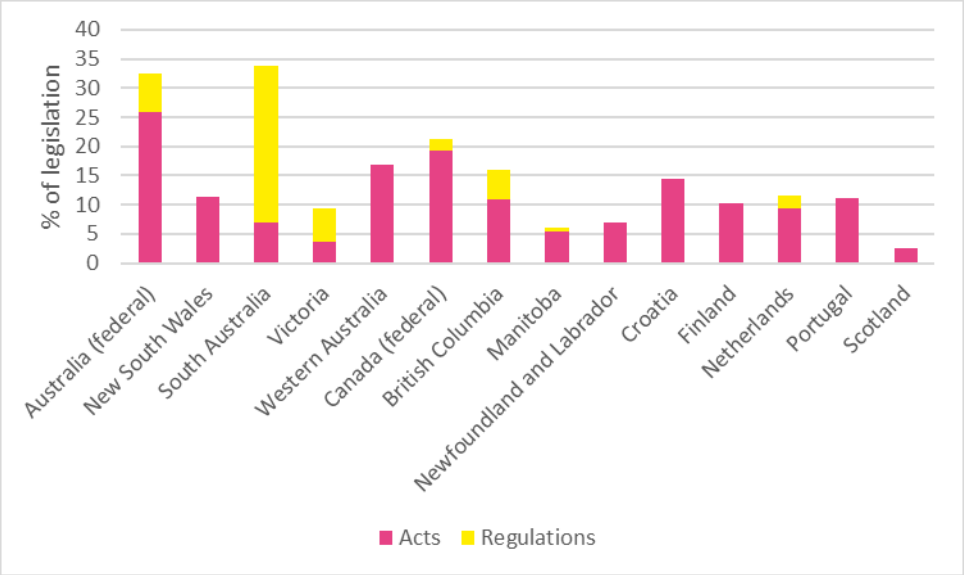

Figure 5 Percentage of legislation devoted to 'emergency preparedness and prevention'

3.3.3 Surveillance and notification

The category 'surveillance and notification' was matched to IHR core capacities 2 and 3, which are 'coordination and national focal point communications' and 'surveillance', respectively. This category details the requirement for establishing surveillance networks to monitor the occurrence of disease. These networks join municipal and regional authorities to provide a national status of infectious disease incidence, extract knowledge on newly emerging diseases, and inform the timely implementation of control measures during outbreaks. At 270, this category had the third-highest number of sections mapped to it, with 183 from acts and 87 from regulations.

By percentage, the surveillance and notification category was found to be most highly represented in Portugal's overarching Law No. 81/2009 of August 21, at 30% and eight sections, as shown in Figure 6.[71] This was followed by Finland, at 22%, with 19 sections from the Communicable Diseases Act and 7 sections from associated regulations.[65,66]

A large proportion of the surveillance and notification measures in the Canadian province of Manitoba were introduced by way of regulations (15 sections in the Reporting of Diseases and Conditions Regulation, compared with 18 sections in its overarching Public Health Act).[44,55] A similar trend was noted in the case of British Columbia, whereby most measures for surveillance were introduced through regulations under its Public Health Act; in particular, the Reporting Information Affecting Public Health Regulation of 2018.[48] At the federal level, a relatively small percentage of Canadian public health legislation is devoted to this category, perhaps due to its emphasis in the

provincial legislation. The Quarantine Act is the only federal Canadian instrument to outline general surveillance and notification measures, which are addressed in just five sections of the legislation.[42]

Australian public health legislation addresses this category quite evenly across the federal- and state-level acts. The National Health Security Act 2007 outlines the federal approach, whereas the local approach is outlined by each state's public health act.[26]

Croatia's Act on the Protection of the Population Against Communicable Diseases, Scotland's Public Health etc. (Scotland) Act 2008, and the Netherlands' 2008 Public Health Act each devote a relatively small percentage of their legislation to surveillance and notification measures (Croatia at 5%, Scotland at 6%, and the Netherlands at 10.5%).[64,68,73] The Netherlands legislates for the establishment of a surveillance system, and designates the responsibility for managing this system to the municipalities.

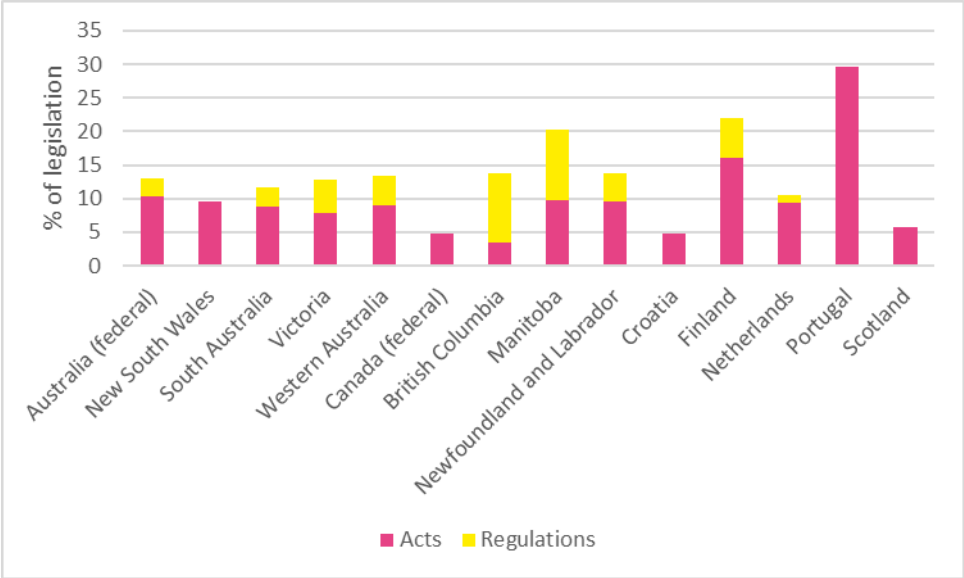

Figure 6 Percentage of legislation devoted to 'surveillance and notification'

3.3.4 Officers and designated offices

The 'officers and designated offices' category deals with the organisational aspects of the public health structure in each country as outlined in national legislation; an example would be the designation of competent persons and the role of local authorities in protecting public health against the threat of infectious disease. These sections of the health legislation detail the types of officers and agencies engaged in the public health function under the acts, as well as the responsibilities of public health authorities. This category was matched with IHR core capacity 2, 'coordination and national focal point communications', which describes the establishment of the national focal point and the organisation of agencies whose functions relate to implementation of the revised IHR. Altogether there were 243 sections, making this the fourth most represented category in the legislation: 211 of these sections originated from overarching acts, and 32 originated from regulations.

Sections pertaining to officers and designated offices accounted for 12% of the overall legislation, and the category was most highly represented in Portugal, comprising 22% of the country's public health legislation, with all six sections originating from Law No. 81/2009 of August 21.[71] This was followed by South Australia, with 20% of its health legislation devoted to officers and designated offices (31 of the sections were from the South Australian Public Health Act 2011 and 4 were from the South Australian Public Health (General) Regulations 2013).[31 33] Finland devoted the lowest percentage of legislation to this category, at just 2.5%.[65]

In general, we found this category to be quite homogenously distributed across each country, as shown in Figure 7, particularly in Australia and Canada, with measures being laid down at both federal and state/provincial level

Figure 7 Percentage of legislation devoted to 'officers and designated offices'

3.3.5 Ministerial and political interface

The category 'ministerial and political interface' was matched to IHR core capacity 1, 'national legislation, policy and financing' and deals with the powers given to Ministers, Governors, Secretaries, and other authorities for the purposes of carrying out functions under the public health legislation. This includes the power to make regulations under the overarching public health laws. As an important category for the application of the legislation, only 10 sections overall originated from regulations, with the remaining 198 enacted via overarching public health acts. Ministerial and political interface had the fifth-highest number of mapped sections, at 208.

This category was almost universally present in each country's overarching public health acts, as shown in Figure 8, except for Portugal's Law No. 81/2009 of August 21, which was not found to legislate for the regulation-making powers of the legal authorities in the context of responding to communicable disease threats.[71] In terms of other European countries, Finnish and Scottish sections aligned to this category accounted for less than 10% of these countries' overall public health legislation, while Croatian and Dutch public health legislation each comprised 12%.[64,65,68,73]

Federally, Canada devoted the highest percentage of health legislation to this category, at 16%, and introduced these measures through the three federal Acts studied (three sections from the Emergency Management Act, six sections from the Public Health Agency of Canada Act, and eight sections from the Quarantine Act). Ministerial matters were also legislated for at a provincial level, but less so than at the federal level (10% each in British Columbia and Manitoba).[44,47]

In contrast with Canada, Australia's legislation for ministerial and political powers was laid down largely at state level, and only a small contribution to this category was made at federal level (4% overall between the Biosecurity Act 2015, the Biosecurity (Human Health) Regulation 2016, the National Health Security Act 2007, and the National Health Security Regulations 2018)[26-29]. In fact, while federal Australia contributed the least overall to this section (excluding Portugal), the state of NSW contributed among the highest overall at 15%. Similarly, the legislation of the states of South Australia, Victoria, and Western Australia each accounted for a higher contribution to this category compared with that of federal Australian legislation.

Figure 8 Percentage of legislation devoted to 'ministerial and political interface

3.3.6 Resources

The category 'resources' was mapped to core capacities 1 and 7, which were 'national legislation, policy and financing' and 'human resources' respectively. While there could conceivably be some overlap between this category and the 'officers and designated offices' category, 'resources' was taken to mean the assets and funding required in order to carry out the functions under the legislation. There were 49 sections relating to this category identified in total, with 36 of these originating from acts and 13 originating from regulations.

There was no clear majority, as shown in Figure 9, although regulations made under the Public Health etc. (Scotland) Act 2008 are largely devoted to this category; namely the Public Health etc. (Scotland) Act 2008 Designation of Competent Persons Regulations 2009, which outlines the experience and skills necessary to be hired as public health personnel.[73,75] Regulations made under the South Australian Public Health Act 2011, specifically the South Australian Public Health (Fees) Regulations 2019, focus largely on resources, including the costs of certain procedures and hiring personnel.[32] Likewise, the Public Health Personnel Regulation under Manitoba's Public Health Act deals almost exclusively with resources.[61] This is accompanied at the federal level by relevant sections outlined in the Public Health Agency of Canada Act.[77]

This category was not addressed in federal Australian legislation but was instead addressed at the state level in NSW, South Australia, Victoria, and Western Australia (3.5%, 4%, 2.7%, and 1%, respectively).

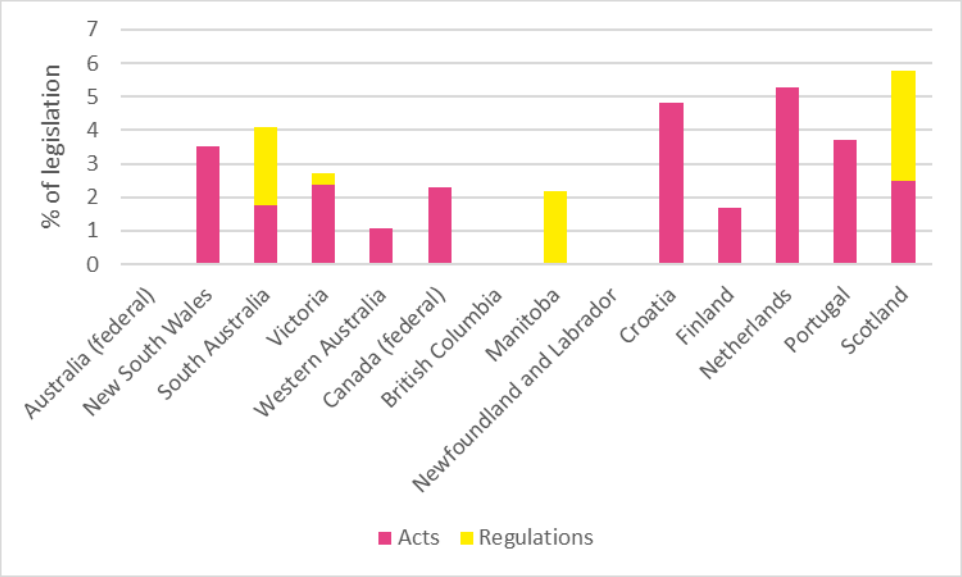

Figure 9 Percentage of legislation devoted to 'resources'

3.3.7 Laboratory

The category 'laboratory' was matched to IHR core capacity 8, 'laboratory', which establishes the need for dedicated diagnostic/surveillance laboratories and outlines laboratory policy in reducing biosecurity risks. Less than 1% of the studied legislation fell under this category, accounting for the lowest number of mapped sections overall. There were 19 sections in total, with 11 of these originating from overarching public health acts and 8 originating from regulations.

Laboratory measures were most highly represented in Finnish legislation, at 3.4%, as shown in Figure 10; this comprised two sections from the Communicable Diseases Act and two from associated regulations.[65,66] This was closely followed by the Canadian province of Manitoba at 3.3% of its legislation, originating entirely from the Reporting of Diseases and Conditions Regulation.[55]

The designation of national reference laboratories was not legislated for in any instance, although these measures may have been in place prior to the introduction of the IHR 2005. None of the overarching public health acts devoted more than two sections to this category.

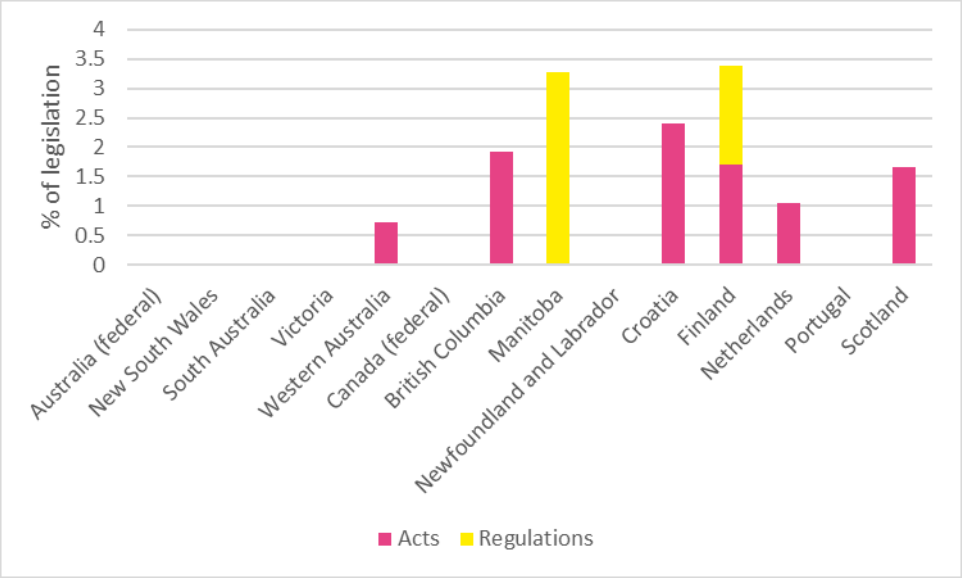

Figure 10 Percentage of legislation devoted to 'laboratory'

3.3.8 Other categories

The categories discussed in Sections 4.3.8.1–4.3.8.4 are not aligned with core capacities of the IHR 2005, but were considered noteworthy aspects for study given the specific policy needs for development of a new Irish framework for public health. These categories are 'appeals and liabilities', 'vaccination', and 'mortuaries and dead bodies'. Furthermore, sections which did not align with any of the listed variables were extracted and placed in an 'unmapped sections' category as per Section 3.3.8.4.

3.3.8.1 Appeals and liabilities

This category deals exclusively with general procedures for appealing or reviewing decisions made under the various public health acts and the sanctions for committing an offence for which the individual is liable. This category had the sixth-highest number of sections mapped to it, with 117 sections. A total of 113 originated from acts, and just 4 originated from regulations.

Appeals and liabilities were most highly represented in the Australian states of NSW and Western Australia (12% and 11%, respectively), as shown in Figure 11.[30,39] Conversely, of the countries that included this category, federal Australian legislation was the least represented, at just 0.4%.[28] This suggests that appeal and liability measures are addressed primarily at the state level in Australia, as opposed to being federal law.

Portugal did not legislate for any appeal and liability measures in its national public health legislation.[71]

Figure 11 Percentage of legislation devoted to 'appeals and liabilities'

3.3.8.2 Vaccination

The category 'vaccination' deals with the immunisation of the population against infectious diseases, the roll-out of vaccines during outbreaks, and the administration of national immunisation programmes. In total, there were 64 sections mapped to 'vaccination', with 36 originating from acts and 28 originating from regulations.

Finland was the most highly represented country in the vaccination category, as shown in Figure 12, devoting 20 sections or 17% of its overall public health legislation to these measures (12 sections from the Communicable Diseases Act, and 8 from the Decree of the Ministry of Social Affairs and Health on vaccinations).[65,67]

This category was not represented in all the national legislation studied. This is seen particularly at federal level in Australia and Canada, with representation instead occurring at the state/provincial levels. British Columbia, in particular, has an entire set of regulations pertaining to vaccination, the Vaccination Status Reporting Regulation.[54]

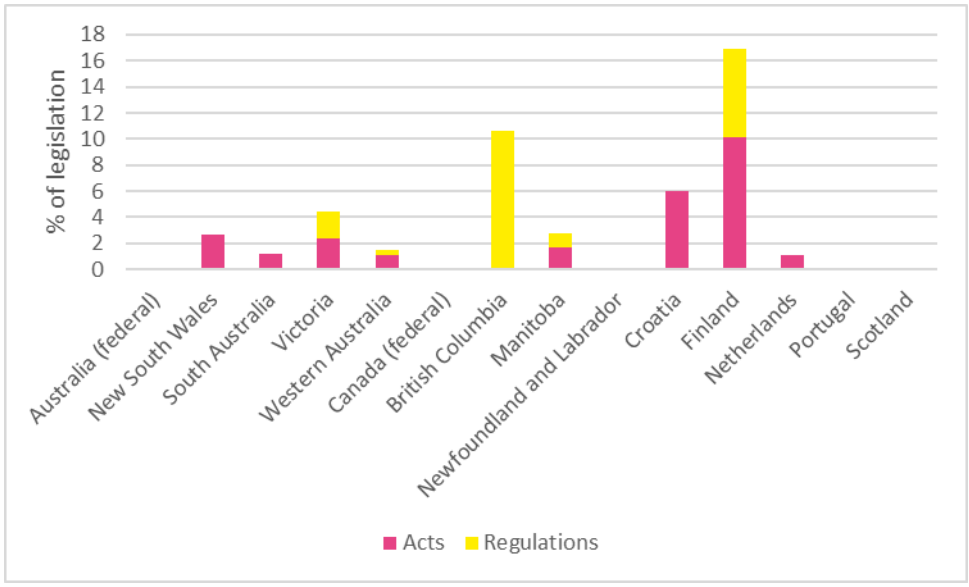

Figure 12 Percentage of legislation devoted to 'vaccination'

3.3.8.3 Mortuaries and dead bodies

This category dealt with the assignment of mortuaries and the handling of human remains in cases where the deceased did not die from an infectious disease. This was considered noteworthy, as some legislation pertaining to the establishment of mortuaries could be significant during severe pandemics, whereby the Minister for Health may have the power to order the temporary storage of bodies. In total, there were 34 sections mapped to this category, with 26 originating from acts and 8 originating from regulations. Croatia devoted the highest percentage of its public health legislation to this category, as shown in Figure 13, with mortuaries and dead bodies representing 8% of the Act on the Protection of the Population Against Communicable Diseases.[64] Additionally, Manitoba's Dead Bodies Regulation was almost entirely devoted to this category.[56]

Mortuaries and dead bodies had the second-lowest number of mapped sections, and was only represented in 7 of the 14 legislative jurisdictions studied.

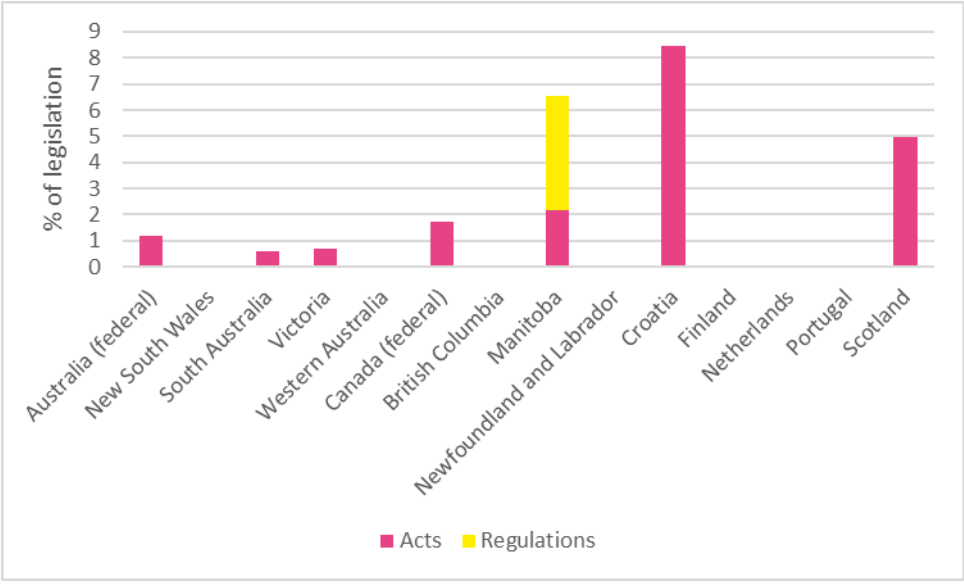

Figure 13 Percentage of legislation devoted to 'mortuaries and dead bodies'

3.3.8.4 Unmapped sections

An 'unmapped' category was used to extract sections of the examined legislation that did not align with any of the categories listed in Table 3. These sections included measures that may have been introduced to fulfil some country-specific policy needs; for example, Scotland's Public Health etc. (Scotland) Act 2008 contains multiple sections on sunbed use.[73] The Australian state of Victoria devoted a large amount of its Public Health and Wellbeing Act 2008 to measures beyond the scope of public health and infectious diseases; for example, registration of businesses, birth reporting, and cooling towers.[37] The Dutch Decree of 27 October 2008, laying down new requirements regarding public health matters (Public Health Decree) contains multiple sections describing the right to healthcare for young people.[69] Lastly, sections pertaining to the management of non-communicable diseases were not mapped, for example in Newfoundland and Labrador's 2018 Public Health Protection and Promotion Act.[62] Of 2,090 sections of legislation overall, 83 were unmapped.

Australian legislation uniquely has review and sunset clauses to ensure the continued relevance and appropriateness of legislation. The Australian state of Victoria applies a 'sunset' clause to its Public Health and Wellbeing regulations.[78] The aim of the clause is to ensure regulations remain necessary and effective and they address the current issues and risks related to the topics they cover. Regulations 'sunset' or expire every 10 years and they are reviewed and replaced. The NSW Public Health Act 2010 contains a section called 'review of Act'.[30] It indicates that the Minister must review this Act after five years to determine whether the policy objectives of the Act remain valid and whether the terms of the Act are still capable of supporting the objectives.[30] This review of the NSW Public Health Act has been undertaken and has led to the Public Health Amendment (Review) Act 2017.[79] The South Australia Public Health Act 2011 contain a similar review section and this review is ongoing as of August 2019.[31]

4 Question 2 findings: lessons learned

Question 2: What were the lessons learned from the national experience of introducing new overarching legislation for public health, including communicable/infectious diseases? (State or provincial level legislation to be included in Federal countries)

4.1 Results of the search

We screened the titles and abstracts of 1,506 records against the eligibility criteria, and 167 records were selected to be reviewed as full-text publications. Of these, we included 41 studies in this review. The number of studies included and excluded at each stage of the screening process is provided in Figure 14.

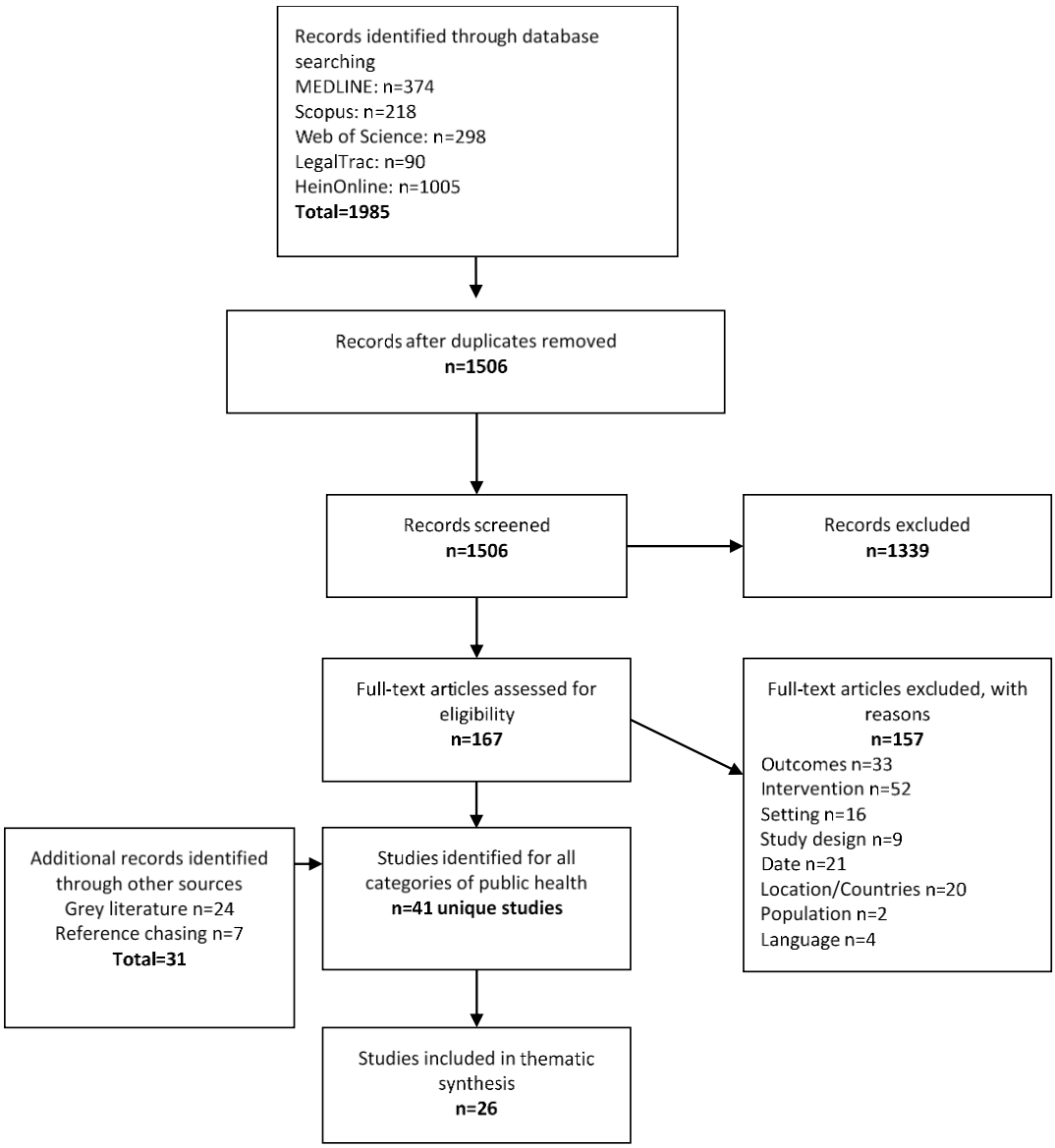

Figure 14 PRISMA diagram for Question 2

We then identified the primary focus of each of the 41 studies that were included following full-text screening, and these categories are depicted in Figure 15. The majority of studies focused on infectious disease. Other categories included 'social determinants of health and health equity',

'vaccination', 'business compliance with public health standards', 'pollution (including water)', and 'non-communicable diseases'. Due to time constraints, it was not feasible to synthesise data from all of these categories. We therefore focused on the 26 articles in the 'infectious disease' category and excluded the other categories. This aligns with the focus on infectious diseases in the forthcoming Irish public health policy.

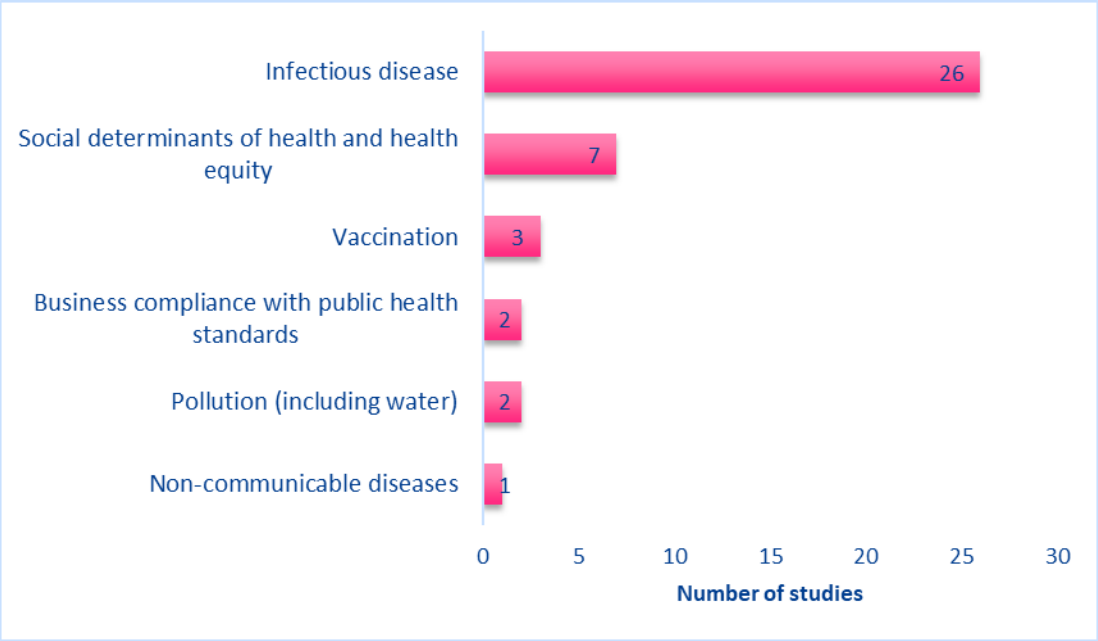

Figure 15 Focus of lessons learned studies

4.2 Studies included in thematic synthesis

The characteristics of the 26 studies that we included are provided in Table 4. The majority of the studies were from Australia (i.e. 16 out of the total of 26). Six of the Australian studies reported federal-level findings, six reported on South Australia specifically, two focused on NSW, and two focused on Victoria. As described in Section 3.3.8.4, South Australia and NSW have review clauses in their public health legislation, meaning that after a defined period of time the legislation must be publicly reviewed. This systematic review identified two public reviews: one from South Australia and one from NSW.

The public review of the South Australian Public Health Act 2011 commenced in 2018. When we were carrying out our searches for the purposes of this review (from July to August 2019), a final statutory report was not available, as the Social Development Committee of the Government of South Australia was still reviewing the submissions received.[80] Therefore, we screened each of the 35 submissions received by the Government of South Australia in response to the review of the South Australian Public Health Act 2011. Six submissions met the eligibility criteria and were included in this systematic review (we counted each of these six submissions as a separate report), the rest of the submissions were excluded for study design and outcomes reasons.

The public review of the NSW Public Health Act 2010 was carried out in 2016. The NSW Government received 269 submissions, and a report was prepared detailing the findings of the review. The report synthesised the submissions; therefore, we relied on the synthesis and did not review the 269 individual submissions.

Our thematic synthesis also included three studies from Canada – two at the federal level and one from Manitoba. There were five studies from Europe – two from Scotland, two from the Netherlands, and one from Finland. Finally, there were two studies with an international focus.

As outlined in Table 4 the majority of the individual studies' research aims did align with our research question. Only study data relevant to the research question have been extracted and used in this

report. Therefore, in some cases, large parts of the original studies have not been utilised as they do not provide evidence to inform this particular research question.

Table 4 Study characteristics for Question 2

Study ID	Country	Relevant public health act	Study design	Time period of analysis	Study aim
Bakker 2018	The Netherlands	Public Health Act	Legislative analysis	–	A critical assessment of two patients with infectious TB who were subject to coercive measures for months. Asking whether the public health act and the medical treatment agreement act interpreted and applied? Are the rights of these patients sufficiently respected? What is the position of the World Health Organization (WHO) about compulsory treatment for TB, and is there also a Dutch position?
Bennett 2010	International	–	Literature review	2005–2010	To examines the threats posed to human health by zoonotic diseases and the challenges for public health posed by the rapidly changing and unpredictable nature of influenza viruses. The requirements of the IHR are outlined and considered in light of the constraints facing resource-poor countries. Finally, country level lawmaking is also a key component in supporting global public health and the paper suggests some ethical principles that should underpin the crafting of laws for public health emergencies.
Bennett 2012	Australia	Multiple	Literature review	–	This article focuses on the legislative arrangements for declaring a public health emergency across the various Australian jurisdictions with a view to assessing how federalism impacts on the balance struck between goals such as public confidence, harmonisation and flexibility.
Connolly 2015	Scotland	Public Health etc. (Scotland) Act 2008	Mixed methods	2005–2011	The purpose of this paper is to examine the governance and policy-making challenges of UK health security disaster prevention in the context of "wicked problems" based on the case of pandemic influenza.
Fafard 2018	Canada	Public Health Agency of Canada Act, and provincial acts	Legislative analysis	2017	This article analyzes public health legislation across Canada that governs the Chief Medical Officers of Health role.
Gibney 2016	Victoria, Australia	Public Health and Wellbeing Act 2008	Audit	2013	This paper represents an audit of notifications received in 2013 by the Department of Health and Human Services Victoria into their surveillance system. Such audits have been performed every 1–3 years since 20043–7 to inform Victorian public health staff and notifiers of notification practices

Study ID	Country	Relevant public health act	Study design	Time period of analysis	Study aim
					in Victoria and identify notifier and system factors that need improvement.
Javanparast 2019	Australia	Multiple	Mixed methods	2012–2016	To examine the strength and extent of collaborations between primary health care organisations and local government in population health planning.
Low 2010	Australia	Multiple	Case study	2009	This report describes the epidemiology and control of the first 350 cases of H1NI1 notified between May and June 2009 IN Singapore.
Ly 2007	Australia	Multiple	Literature review	–	This article argues that governments should devise financial plans to compensate businesses and individuals who suffer losses during pandemic and post-pandemic scenarios when the losses relate to compliance with public health measures, with the principle of reciprocity as a basis.
Nelson 2019	Victoria, Australia	Public Health and Wellbeing Act 2008	Audit	2016–2017	The objective of this audit was to describe notification practices in 2016 and 2017, assess the effect of enhanced surveillance programs on Indigenous status data completeness and provide a baseline assessment that can be used to monitor the impact of a legislative change to notification requirements for several of the notifiable diseases which came into effect on 1 September 2018.
NSW Government 2016	NSW, Australia	Public Health Act 2010	Legislative analysis	2016	Section 136 of the Public Health Act requires that a review of the Act must be held 5 years after assent of the Act and a report on the review is to be tabled in Parliament within 12 months from the commencement of the review. This Report has been prepared to detail the findings of the review. Submissions received in response to the Discussion Paper have been considered in developing this Report.
Rowe 2019	Australia	National Health Security Act 2007	Primary qualitative	2017–2018	To review the use of data linkage by Australian state and territory communicable disease control units, and to identify barriers to and enablers of data linkage to inform communicable disease surveillance and control activities.
Spagnolo 2018	International	–	Literature review	–	This article analyses the means at the disposal of the WHO for sanctioning its Member States, both from the perspective of WHO's internal rules and from the perspective of the law of international responsibility, evaluating if countermeasures might represent a viable solution.

Study ID	Country	Relevant public health act	Study design	Time period of analysis	Study aim
Stratigos 2017	NSW, Australia	Public Health Act 2010	Legislative analysis	2017	To review recent public health law changes in relation to HIV
Submission 009 Alexandrina Council	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
Submission 011 Environmental Health Australia	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
Submission 014 Doctors for the Environment	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
Submission 027 Cancer Council of SA	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
Submission 028 Local Govt Association of SA	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
Submission 035 Southgate Institute for Health Society and Equity	South Australia, Australia	South Australian Public Health Act 2011	Legislative analysis	2011–2019	To provide feedback during the review of the South Australia Public Health Act
The Health Protection Stocktake Working Group 2011	Scotland	Public Health etc. (Scotland) Act 2008	Stocktake	2010–2011	This interim report examined working structures in health protection by setting out what the working group saw as the potential models of working in Scotland and makes some early recommendations around roles.
Todrys 2013	Manitoba, Canada	Public Health Act	Case study	2010–2011	The purpose of the present study was to examine how rights-limiting measures are imposed for infectious disease control, and the national and international legal frameworks justifying such measures. A review of court documents related to two recent cases in Kenya and Canada of individuals with drug-susceptible TB who were incarcerated for non-adherence was conducted in conjunction with a review of international instruments and relevant literature.

Study ID	Country	Relevant public health act	Study design	Time period of analysis	Study aim
van Dijk 2015	The Netherlands	Public Health Act	Survey	April to December 2009	The objective of this study was to report on general practitioners' and practice assistants' acceptance of the national policy, and experiences in the Netherlands during the H1N1 pandemic.
WHO JEE Australia 2018	Australia	Multiple	Legislative analysis	2017	This report is the product of a Joint external evaluation of the capacity of Australia to prevent, detect and rapidly respond to public health threats of a natural, deliberate or accidental nature.
WHO JEE Canada 2019	Canada	Multiple	Legislative analysis	2018	This report is the product of a Joint external evaluation of the capacity of Canada to prevent, detect and rapidly respond to public health threats of a natural, deliberate or accidental nature.
WHO JEE Finland 2017	Finland	Communicable Diseases Act	Legislative analysis	2017	This report is the product of a Joint external evaluation of the capacity of Finland to prevent, detect and rapidly respond to public health threats of a natural, deliberate or accidental nature.

4.3 Quality appraisal

Of the 26 included studies, 11 were empirical studies that could be appraised using the Mixed Methods Appraisal Tool (MMAT).[19] A full explanation of the assigned quality ratings is given in Appendix D.

Seven studies were classified as quantitative descriptive studies, and the critical appraisal of these studies is given in Table 5. Three of the seven studies answered yes in all five quality categories.[81-83] The van Dijk study's was found to be at high risk of bias for the response rate criterion; however, the paper did undertake statistical analysis to understand who the non-responders were.[84] The response rates were not assessed in the three WHO Joint External Evaluation (JEE) reports and so they were given a cannot tell rating for the non-response criterion.[85-87] A sampling strategy was not reported for the JEE reports either, and so they were assigned a cannot tell rating for the sampling strategy criterion.

Table 5 Critical appraisal of quantitative descriptive studies

Study ID	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of non-response bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Nelson 2019	Yes	Yes	Yes	Yes	Yes
Gibney 2016	Yes	Yes	Yes	Yes	Yes
van Dijk 2015	Yes	Yes	Yes	No	Yes

WHO JEE Australia 2018	Cannot tell	Yes	Yes	Cannot tell	Yes
WHO JEE Finland 2017	Cannot tell	Yes	Yes	Cannot tell	Yes
WHO JEE Canada 2019	Cannot tell	Yes	Yes	Cannot tell	Yes
Low 2010	Yes	Yes	Yes	Yes	Yes

Three studies were qualitative analyses, and the critical appraisal of these studies is summarised in Table 6, with a full explanation given in Appendix D. One study was rated 'yes' on all MMAT questions.[88] The second study had unclear quality, as the method of analysis was not described and therefore, 'cannot tell' was the assessment for three of the five criterion of the MMAT.[89] The final study was judged as no when asked 'Is the interpretation of results sufficiently substantiated by data?', as it did not utilise quotes from the interviews conducted to support the findings.[90]

Table 6 Critical appraisal of qualitative analysis studies

Study ID	1.1. Is the qualitative approach appropriate to answer the research question?	1.2. Are the qualitative data collection methods adequate to address the research question?	1.3. Are the findings adequately derived from the data?	1.4. Is the interpretation of results sufficiently substantiated by data?	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?
Connolly 2015	Yes	Yes	Yes	Yes	Yes
Todrys 2013	Yes	Cannot tell	Cannot tell	Yes	Cannot tell
Rowe 2019	Yes	Yes	Yes	No	Yes

Only one mixed methods study was assessed, and the results of the appraisal are shown in Table 7. No rationale was given for using a mixed methods design so it was assigned a no for the first criterion, and the HRB was unable to determine the quality of the quantitative analysis due to incomplete reporting of the methods, so the study was assigned as 'cannot tell' for the final criterion.[91]

Table 7 Critical appraisal of mixed methods studies

Study ID	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	5.2. Are the different components of the study effectively integrated to answer the research question?	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

Javanparast 2019	No	Yes	Yes	Yes	Cannot tell

4.4 Thematic synthesis

Seven overarching themes emerged from our thematic synthesis of the included articles (see Figure 16). Individual lessons learned are presented throughout the remainder of this section under these themes. Three of these themes aligned with the legislative categories identified in Question 1: 'emergency preparedness and prevention', 'control and treatment', and 'surveillance and notification'.

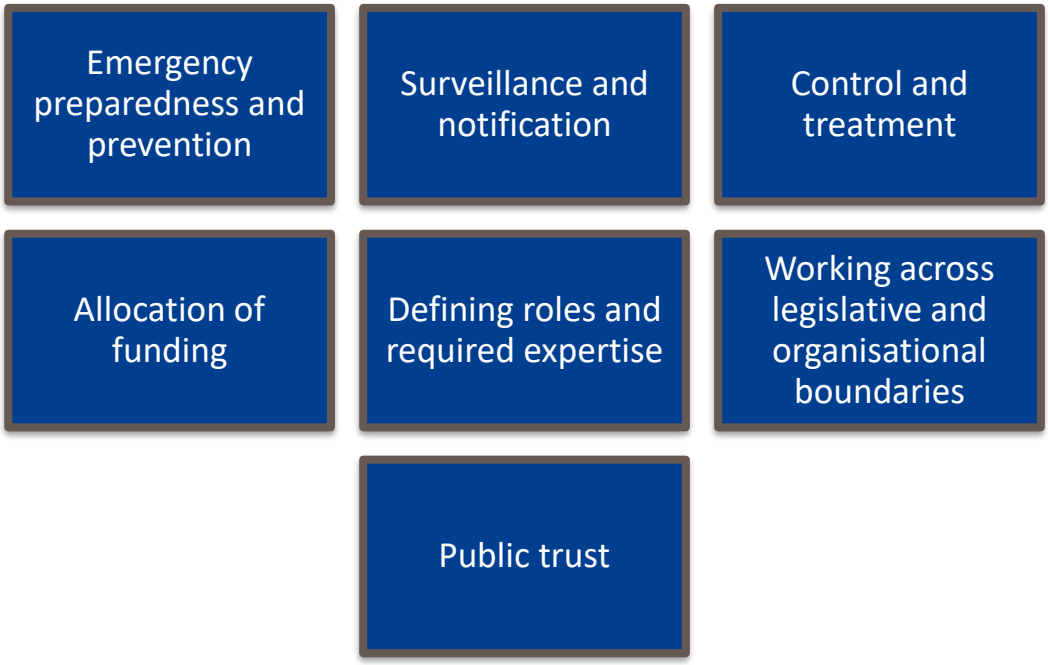

Figure 16 Themes for lessons learned

4.4.1 Emergency preparedness and prevention

4.4.1.1 Awareness of the WHO IHR

Several studies highlighted the importance of all stakeholders being aware of the IHR. In Finland, a WHO JEE reported that there was a lack of awareness of the IHR in critical non-health sectors.[87] Moreover, the authors found that this may have affected coordination of IHR reporting and may have hindered further development of IHR capacity to respond. Specifically, the report noted the importance of awareness of the IHR in the zoonotic sector in order to enable further collaboration between human and animal disease surveillance activities.[87]

Canada has sought to increase awareness of the IHR by providing a variety of formal and informal training opportunities.[85] These workshops and sessions are available to the key reporting contact personnel of all stakeholder groups in order to ensure a common understanding of obligations under the IHR. These individuals play an active role in raising awareness of IHR reporting obligations. Canada has also introduced IHR champions who support IHR advocacy across the country, promote training, and share assessment results with other stakeholders.[85]

4.4.1.2 Engagement in planning

A study from the Netherlands reviewed the national response to the H1N1 pandemic and reported on the importance of engaging relevant actors in creating emergency preparedness plans.[84] In particular, the study found that general practitioners (GPs) did not comply with all infection prevention measures that were advised (e.g. wearing gloves, face masks, goggles, and disposable aprons), as they were not considered feasible to implement in busy practices. The study authors recommended engaging GPs in the development of new operational scenarios for future pandemics in order to

assess the feasibility of recommendations, given GPs' day-to-day workloads and practice arrangements.[84]

4.4.1.3 Use of non-health resources through enactment of emergency acts

In each country included in this review, the Department of Health had the overarching responsibility for public health. However, in a public health emergency, additional organisations could be drafted in. For example, in Australia, emergency acts (which are entirely separate from public health acts) can be triggered in the case of pandemics or other public health emergencies.[14] When an emergency act is triggered, governments can utilise resources (e.g. staff and equipment) from non-health Government Departments in order to support public health.[14]

4.4.1.4 Flexibility in legislation and emergency response

Flexibility in the public health legislation was also considered important in Australia. The WHO JEE of Australia found that temporary legislative measures ensured flexibility in maintaining compliance with the IHR.[28,86] For example, the Biosecurity Act 2015 includes provisions that allow temporary measures under the IHR to be implemented (e.g. establishing a temporary biosecurity monitoring zone at points of entry) in order to enable a response during a public health emergency of international concern.[28,86]

A literature review by Bennett *et al*. found that the flexibility afforded by temporary legislative arrangements – specifically the option to trigger an emergency act, and the use of less prescriptive legislation – facilitated tailored deployment of powers and timely revision of response plans depending on the severity of the disease.[14] However, the authors cautioned that any powers written under less prescriptive legislation should be subject to strict legal safeguards, such as short durations of emergency declarations.[14]

4.4.1.5 Testing preparedness

The WHO JEE of Finland highlighted that it is best to run preparedness exercises in order to test public health legislation and policies for effectiveness.[87]

4.4.1.6 Fines to ensure compliance

In South Australia, a submission to the review of the South Australian Public Health Act 2011 noted that the fines associated with the suite of public health regulations should be sense-tested in practice and in relation to other legislation in order to ensure that the fines provide a disincentive for noncompliance;.[92] for example, the cost to organisations of enforcement, such as licenses for waste water systems, should be less than the associated fines for illegal waste water systems.

4.4.2 Surveillance and notification

4.4.2.1 Follow-up after initial notification

Two audits from Victoria, Australia, found that when notified cases were followed up, either by public health staff or by an automatic redirection to an enhanced surveillance form, demographic data were more likely to be reported. This was particularly important for at-risk populations, such as Indigenous people.[81,82]

4.4.2.2 Timely notification

A submission received from a local council in South Australia in response to the review of the South Australian Public Health Act 2011 indicated that timely notification is critical in implementing preventative measures.[93] The submission also suggested that more needed to be done to improve timeliness, as notification weeks or months after a notifiable disease was irrelevant and a waste of resources for all involved.[93]

In Victoria, Australia, Gibney *et al*. found that educating doctors about the importance of complete notifications helped to ensure appropriate and timely notification.[82] Also in Victoria, Nelson *et al*. found that it was useful to reduce the need for manual entry of notification data during periods of increased demand in order to maintain timely provision of information. For example, the Department

of Health and Human Services in Victoria decided not to require notifications of influenza from doctors (which was a manual process) during an influenza outbreak in 2017, but maintained the notification requirement for laboratories.[81]

Nelson et al. also reported that in Victoria, Australia, electronic reporting and web-based systems can result in more timely notifications than can be achieved by post and fax.[81] In their audit, the authors found that 85% of routine cases in 2016 and 84% in 2017 notified by post or fax were received within the legislated 5-day time frame, but that 96.4% of routine cases in 2016 and 2017 notified by doctors online were received within 5 days.[81]

4.4.2.3 Timely access to data for researchers

A submission to the review of the South Australian Public Health Act 2011 indicated that timely access to data for researchers was important in order for research to be up to date and relevant.[94]

4.4.2.4 Data linkage

Linked health records are desirable in infectious disease surveillance, and several studies reported lessons learned in this area. In Finland, communicable disease surveillance employs unique personal identifiers to allow linkages to additional data sources.[87]

In Australia, perceived need was considered both a prohibiting and enabling factor for the use of data linkage for communicable diseases.[90] Perceived need was linked to the size of the state – in smaller states and surveillance centres, pertinent information relevant to communicable disease surveillance could easily be gleaned on a case-by-case basis via access to unlinked databases. As a result, data linkage was not a priority in states with a small population. States with larger populations reported a strong desire for data linkage systems in order to support communicable disease surveillance and control activities.[90]

Rowe *et al.* also found that a lack of resources and skills was a barrier to data linkage for communicable diseases.[90] Linked data systems require dedicated staff with adequate skills in terms of analysis, interpretation, and reporting.[90]

4.4.2.5 Requirements to notify and provide information

Studies included in this review also addressed which individuals and organisations should be required to submit notifications. The NSW Government has stipulated that notification requirements should include all laboratories that conduct testing for diseases and conditions, including chemical laboratories and those monitoring occupational health under the Work Health and Safety Regulation 2017.[95,96]

The NSW Government has also indicated that medical practitioners involved in a patient's care should be required to provide information concerning that person's medical condition, transmission, and risk factors regardless of where the notification was made (e.g. laboratory or death certification).[95] Additionally, the NSW Government determined that there should be a mechanism for requiring notification by classes of persons other than medical practitioners, as evolving clinical practices mean that other practitioners will increasingly order testing for diseases and conditions.[95]

A submission to the review of the South Australian Public Health Act 2011 indicated that private hospitals also need to provide data to the appropriate authority e.g. Communicable Disease Control Branch, in order to ensure a comprehensive national understanding of disease prevalence and progression.[94]

4.4.2.6 HIV testing

Several of the lessons identified in this systematic review related specifically to HIV testing. The 2016 review of the NSW Public Health Act 2010 recommended that patients be named on HIV test request forms in order to prevent patients being given someone else's test results and to prevent the resulting harms.[95] This change was enacted in the NSW Public Health Amendment (Review) Act 2017.[30]

4.4.2.7 Antimicrobial resistance

The WHO JEE report for Australia found that there was increased use of antimicrobial medicines in community healthcare centres compared with use in hospital settings.[86] The report also found that detection, surveillance, and stewardship for antimicrobial resistance are mostly focused on hospital structures. The report recommended that these activities be extended to community healthcare centres.[86]

4.4.3 Control and treatment

4.4.3.1 Requirement for detention and quarantine

Several studies outlined special cases which warrant quarantine, and which should be legislated for accordingly. The NSW Government highlighted the need to contain a person who has been in contact with an infected person.[95] The NSW Government also noted that health detention orders are needed in legislation for persons who have come in contact with an infected person, as it is almost always impossible to exclude a contact as being infected until a defined time period – the maximum incubation period – has passed.[95] In the Netherlands, a study reported that when patients are released as soon the period of infectivity has passed, they present a high risk of discontinuing treatment and of becoming infective again.[97] The NSW Government also reported that legislative provisions are needed for a person to be detained, regardless of whether or not the person can receive treatment for the disease.[95]

4.4.3.2 Impact of detention and quarantine on the individual

Four of the studies identified by this systematic review, including two literature reviews, highlighted that emergency provisions such as quarantine must be used only when strictly necessary and should be balanced with individual rights, in order to avoid impinging unnecessarily on privacy and to prevent human rights violations.[14,16,89,95]

Two literature reviews also suggested that because public health measures such as quarantine represent a serious infringement on the individual and may compromise an individual's financial well-being, they should be accompanied by financial support for the individual so as to not be an active disincentive for compliance.[13,15]

4.4.3.3 Increased workload among GPs

A study in the Netherlands of the experiences of GPs and practice assistants during the H1N1 pandemic found that the additional preventative vaccination programme resulted in an increased workload for GPs and practice assistants, and daily work was compromised as a result.[84]

4.4.3.4 HIV disclosure and access to data

Regarding surveillance and notification, there were also specific lessons learned regarding HIV patients. The NSW Government updated legislation to ensure that clinicians are not unduly constrained in accessing information about a patient's HIV status, in order to provide the best possible care to patients.[95]

A review of the NSW Public Health Amendment (Review) Act 2017 highlighted that the removal of the requirement to disclose HIV status is in line with international best practice.[98] The review also noted that the previous practice of applying criminal penalties for exposure and non-disclosure of HIV status was counterproductive to public health goals.[98]

4.4.3.5 Clarifying the responsibilities of all persons with respect to the prevention of infectious diseases

Following the removal of the requirement to disclose HIV status, the NSW Government responded to stakeholder feedback and decided that the Public Health Act 2010 should contain a provision setting out the responsibilities of all persons with respect to the prevention of infectious diseases.[95] The NSW Government described this decision as follows:

> "The protection of public health is an important responsibility of all members and sections of the community. Having an express provision in the Act relating to the responsibilities of individuals to reduce the risk of transmission of an infectious disease of both those with an infectious disease and those at risk of contracting an infectious disease is considered to appropriately reflect general community expectations about measures that should be taken to minimise the transmission and spread of infectious diseases."[95(P37-38)]

4.4.3.6 Minister's power

The NSW Government also considered the power of the Minister/Health Secretary, and reported that the Minister should have the power, following a public health inquiry, to direct a person, organisation, or business to notify persons at risk of harm regarding the risk and the measures to mitigate that risk, including testing for diseases.[95] The NSW Government described this decision as follows:

> "If a public health inquiry identifies poor infection control practices at a health facility, notification of patients of the risk and the need to undertake appropriate testing may be best done by the health practitioner concerned as the practitioner is likely to have the records of the patients and a relationship with the patients. In these circumstances, it is considered appropriate for the Secretary to have a power to direct the person to notify persons at risk and of measures that should be taken to mitigate their risk."[95(p54-55)]

4.4.4 Allocation of funding

4.4.4.1 Adequate resources

In South Australia, most public health infrastructure is provided through local government. The Southgate Institute for Health, Society and Equity's submission to the review of the South Australian Public Health Act 2011 highlighted that adequate resourcing of local government is necessary if it is to fulfil its responsibilities in public health.[99] In particular, the submission noted the importance of adequate financing for health planning, implementation, and biennial reporting at the local level.[99]

4.4.4.2 Allocation of funding

Another submission to the review of the South Australian Public Health Act 2011 reported that when additional public health tasks are allocated, they must be accompanied by additional financing.[93] The submission referenced an example in which additional tasks were assigned, yet there had been a budget cut to the agency that was responsible for those tasks.[93]

The WHO JEE found that clear allocation of funding for health emergency planning and response can provide a strong basis for IHR implementation activities.[86] In Australia, the Financial Framework (Supplementary Powers) Regulations 1997 provide a framework for the expenditure of public moneys. In particular, they provide funding for health emergency planning and response, including IHR core capacities such as response, and laboratory. The clear allocation of this expenditure provides a strong basis for IHR implementation activities.[86]

In Scotland, the Health Protection Stocktake Working Group's report found that some health protection problems are not reflected in National Health Service (NHS) structures or funding patterns and that more needs to be done to account for these unexpected demands.[100] For example, NHS Greater Glasgow and Clyde, with its large urban population, is incurring a high increase in costs associated with treating HIV.[100]

4.4.4.3 Impact of budget cuts

The WHO JEE report on Finland outlined how budget cuts have affected two key areas: they have led to a reduction of activities focused on antimicrobial resistance, and to challenges in retaining the laboratory workforce and maintaining reference laboratories.[87]

4.4.5 Defining roles and required expertise

4.4.5.1 Roles and expertise of chief medical officers and chief public health officers

Several of the included studies reported on the roles and expertise of chief medical officers and chief public health officers. In Canada, the Chief Medical Officers of Health (also known as Chief Public Health Officer, Provincial Health Officer and National Public Health Director in difference provinces) at federal level and in each province or territory have responsibility for the protection and promotion of the health of the public and the prevention of disease and injury.[101] However, Fafard *et al*. reviewed the role of Chief Medical Officers of Health in Canada and found that the power and authority of the federal and provincial Chief Medical Officers of Health are not clearly defined in legislation, leading to confusion and conflict.[102]

In South Australia, the role of Chief Medical Officer and Chief Public Health Officer is a combined position. In the role of Chief Medical Officer, the individual is the primary source of medical advice for the Department for Health and Wellbeing, the Chief Executive, and the Minister of Health. The public presentation of medical advice, resolution of technical medical issues, and development of medical professions within South Australia are also overseen by the Chief Medical Officer. As the Chief Public Health Officer, the same individual has accountability for public health and communicable disease issues and also advises the Minister of Health and the Chief Executive of the Department for Health and Wellbeing regarding public health matters.[103]

Many submissions to the review of the South Australian Public Health Act 2011 reported that the Chief Public Health Officer should be a dedicated full-time position, distinct from the Chief Medical Officer, in order to ensure that public health receives the focus and resources required to guarantee community health outcomes.[94,99,104] Several submissions also reported that the Chief Public Health Officer should be required to demonstrate public health or environmental health expertise, qualifications, and experience.[99]

4.4.5.2 Expertise within health boards

The Health Protection Stocktake Working Group in Scotland highlighted that regional health boards had inadequate expertise regarding health protection. It reported that small health boards in particular faced difficulties in responding to even routine health protection issues due to a lack of capacity and resources.[100]

The report also noted that there were no dedicated 24-hour health protection consultant doctors available.[100] As a result, regional health boards were dependent on out-of-hours (on-call) cover from public health consultants whose daytime roles may not include health protection.[100]

The Health Protection Stocktake Working Group used a broad definition of health protection: “To protect the Scottish public from being exposed to hazards which damage their health and to limit any impact on health when such exposures cannot be avoided”.[100(P56)] The group notes that such hazards can be biological, chemical, physical, or from radiation, and can result in exposures through food, water, or air; from animals or the environment; and person to person.[100]

4.4.5.3 Role and expertise of local governments

The role and expertise of local governments was also considered in the included studies. In South Australia, submissions to the review of the South Australian Public Health Act 2011 reported that the roles of public health partner authorities and local councils should be more clearly defined in legislation in order to avoid confusion and to ensure that partnerships are operating as intended.[92,105]

In NSW, the review of the Public Health Act 2010 found that a certain degree of freedom in how roles should be fulfilled was needed so that local authorities could use local knowledge to greater effect.[95] The review noted that the Public Health Act should not give specific details about how local governments are to undertake their role. This would enable them to take a risk-based approach to regulation and focus their work on areas that pose the biggest public health risk, which may differ across the state and may change over time.[95]

A submission to the review of the South Australian Public Health Act 2011 highlighted concerns regarding the ability of local councils to promote public health messaging.[94] The Cancer Council of South Australia suggested that local councils may not have the time or skills necessary to promote public health messaging, particularly in terms of prevention. The submission also noted that leaving prevention messaging to local councils has led to inconsistencies in messaging across councils. Additionally, some local councils did not conduct any public health messaging, and in some of these councils, messaging was carried out by non-government organisations instead. The submission emphasised that this practice is not sustainable.[94]

4.4.5.4 Buy-in to public health roles and responsibilities

The Health Protection Stocktake Working Group in Scotland highlighted the importance of buy-in regarding the roles of all agencies working in public health.[100] In Scotland, there has been a lack of buy-in from some NHS boards regarding the role and remit of Health Protection Scotland. The Health Protection Stocktake Working Group also reported that some boards appear to feel that there may not be a need for the full extent of the surveillance and diagnostic work currently conducted by Health Protection Scotland.[100] As described in Section 5.1, Scotland is trying to address these challenges by creating a new public health body.

4.4.5.5 Reliance on external agencies

Scotland relies on external agencies for some services, which can lead to delays and conflicts of interest.[100] In particular, Scotland relies on services provided by Public Health England (formerly the Health Protection Agency), and has also used contractors from the United States of America. Conflicts may arise when trying to prioritise the needs of organisations – for example, those of the Scottish Government against those of the UK Department of Health and the NHS in England.[100]

4.4.6 Working across legislative and organisational boundaries

Both Canada and Australia are federated countries, with the federal governments and state/provincial governments sharing responsibility for public health. Within these countries and their states or provinces, responsibility for public health is also shared across several organisations, including health boards and local authorities. This section outlines the lessons learned from working across these legislative and organisational boundaries.

4.4.6.1 Coordination of notification

A central requirement of the WHO IHR 2005 is that countries have a national focal point. Even in federated countries like Canada and Australia, there should still be just one national focal point. A research team based in Singapore reported on its experience working with Australian states during the 2009 H1N1 outbreak.[83] The team members observed a lack of coordinated information sharing across state boundaries in Australia, and they reported that this impeded efforts to stop the spread of the virus. The authors suggested that there should be a coordinated IHR notification framework between the different states in a federated country.[83]

A literature review of international studies by Bennett *et al*. recommended that jurisdictional clarity be addressed when developing or amending public health laws in order to ensure that there are clear and transparent lines of responsibility and reporting when responding to public health events.[13]

4.4.6.2 Information sharing

The WHO JEE report for Canada highlighted that information sharing has been essential for public health surveillance and response to acute public health events across Canada.[85] However, the report also found that interjurisdictional data sharing was reliant on informal collegial relationships rather than on formal processes written into legislation. Moreover, the evaluation noted that legislative barriers to information sharing across jurisdictions can impact the timeliness, flexibility, and quality of international reporting under the IHR.[85]

The WHO JEE report for Australia also found that there was a need for legislation to facilitate information sharing between agencies.[86] The Australian Biosecurity Act 2015 does not specifically allow for information related to biosecurity to be shared with the WHO national focal point. According to the WHO JEE report as of 2017, although a workaround is currently in place, an amendment bill is being developed to address this impediment.[86] It has also been noted that Australia's federated political system is a barrier to data linkage, which could improve the completeness of items in the National Notifiable Diseases Surveillance System.[90]

Similarly, in Canada, the WHO JEE found that gaps in the pan-Canadian legal foundation for public health surveillance infrastructure have the potential to undermine capacity to detect public health events affecting multiple jurisdictions.[85]

The Health Protection Stocktake Working Group in Scotland reported a perception that information was not always shared as early as health boards would have liked, along with a sense of conflicting priorities. According to the group's report, these two challenges were likely due to the process of ministerial decision-making and policy requirements, as well as the need to ensure compatibility in approaches across the UK.[100]

4.4.6.3 Consistency across regions

In Scotland, the Health Protection Stocktake Working Group reported variations in local health protection arrangements between health boards, leading to non-standardised approaches across the country.[100] A submission to the review of the South Australia Public Health Act suggested that prescribed templates, guidance documents and/or information circulars could be used to ensure consistency in information sharing and core documents across the state [92]

4.4.6.4 Updating tools and documents under regulation

South Australian councils have suggested that the effectiveness of regulations could be significantly enhanced by updating their subordinate tools and supporting documents.[92] The councils also noted

that some regulations are currently providing links and references to organisations that no longer exist.[92]

4.4.6.5 Decentralisation and responding to public health emergencies

Two studies found that decentralised systems can have certain advantages when responding to public health emergencies. A literature review in Australia found that a decentralised system can allow for more effective distribution of resources and shorter lines of communication in response to extreme situations.[14] A study from Scotland also found that devolved administrations working closely together can enhance responses to pandemics.[88]

4.4.6.6 Role of government

The Health Protection Stocktake Working Group in Scotland found that during some high-profile events, e.g. sporting events, the Scottish Government took on a larger operational role than was appropriate.[100] The group's report also noted a need to ensure that operational activity takes place at the appropriate level and is subject to appropriate governance.[100]

The same report also found that during pandemics, decision-making was too slow at Scottish and UK government level.[100] For example, resolving issues around GP contracts was found to be a particularly slow process. The authors reported that slow decision-making could be attributed to the need to ensure compatibility in approaches across the UK.[100]

4.4.6.7 Role of the national public health body

National public health bodies have been found to play a pivotal role in coordination and responses across countries.[84,85] In the Netherlands, the National Institute for Public Health and the Environment is, among other organisations, responsible for the coordination and provision of information to patients and professionals during infectious disease outbreaks.[84] All involved actors work together in an outbreak management team through managerial coordination meetings; therefore, a well-structured coordination and communication plan is needed in order to implement the recommended communications strategies.[84]

The WHO JEE of Canada reported that the creation of the Public Health Agency of Canada strengthened federal leadership and capacity in public health, both in preparedness for and response to public health emergencies.[85]

4.4.6.8 Public health acts reinforce partnerships and collaboration

In Scotland and Australia, studies have found that public health acts have strengthened collaboration between agencies.

In 2011, the Health Protection Stocktake Working Group reported that Scotland had a culture of partnership, as well as strong networks that could be strengthened and built upon. The report also noted that the Public Health etc. (Scotland) Act 2008 reinforced those existing partnerships.[100]

The same report also found that the relationships between NHS boards and local authorities were strengthened by the Public Health etc. (Scotland) Act 2008, which now requires that NHS boards and local authorities work together to create Joint Health Protection Plans for local areas.[100]

Additionally, a study from Australia reported on the positive impacts of public health legislation as a driving force facilitating collaborative planning within Australian states that have implemented such legislation.[91]

4.4.6.9 Siloed working practices

Siloed working practices and lack of integration were highlighted as challenges in Scotland. The Health Protection Stocktake Working Group reported a distinct lack of a single integrated and coherent public health system in Scotland.[100] It highlighted the need for a common approach to public health leading to a set of clear national outcomes.[100]

4.4.7 Public trust

4.4.7.1 Transparency

In a 2016 review of the Public Health Act 2010, the NSW Government indicated that while detention or quarantine are necessary in limited cases to protect public health (as described in Section 4.4.3), they represent an infringement of liberty, and the Ministry of Health should be transparent in terms of the numbers of such orders made.[95]

4.4.7.2 Community engagement

Two studies in Australia highlighted the importance of community engagement. It was report that engagement with affected communities, such as those with HIV, builds trust and community confidence in the public health system.[14,95]

4.4.7.3 Respecting individual rights and privacy

Several studies reported lessons learned regarding individual rights, and linked these to public trust. A literature review by Bennett *et al.* found that in Australia, community confidence could be retained by showing regard for the civil rights of citizens.[14] The NSW Government reported in 2016 that protection from subpoena is important for all information held under the Public Health Act 2010, in order to ensure that people are satisfied that their data are being used only for public health purposes.[95] Additionally, a literature review of international studies by Bennett *et al*. found that clarification of what information can be collected, and how the privacy of that information will be safeguarded, is an important aspect of maintaining public trust in public health.[13]

4.4.7.4 Minimally invasive containment and compensation

Recognising the disadvantages placed on individuals through public health safety measures such as quarantine was also found to be important to gaining public trust. In Australia, appropriate duration of emergency powers was found to hold public confidence in an emergency.[14] Another study from Australia reported that introducing compensation measures into pandemic plans could increase trust in government and public health institutions.[15]

4.4.7.5 Recognising culture

A literature review of international studies suggested that recognising the importance of culture and the need for national legislation to reflect the values of the population can help to ensure that public health legislation respects the interests and dignity of the individuals it affects.[13]

4.4.8 Table of lessons learned

The lessons learned across themes and subthemes are summarised in Table 8. Context for the lessons summarised in this table is given in sections 4.4.1 to 4.4.7.

Table 8 Table of lessons learned

Themes/subthemes	Lesson learned	Location	References
Emergency preparedness and prevention			
Awareness of the WHO IHR	Lack of IHR awareness may affect coordination of IHR reporting and hinder further development of IHR capacity e.g. in zoonotic sectors	Finland	87
	Canada has a number of initiatives to increase awareness including; formal and informal training opportunities for stakeholders to ensure a common understanding of obligations under the IHR	Canada	85

Themes/subthemes	Lesson learned	Location	References
	IHR champions who promote training and sharing assessment results with other government stakeholders		
Engagement in planning	GPs did not comply with all infection prevention measures that were advised (e.g. wearing gloves, face masks, goggles, and disposable aprons), as they were not considered feasible to implement in busy practices. . The study authors recommended engaging GPs in the development of new operational scenarios for future pandemics in order to assess the feasibility of recommendations, given GPs' day-to-day workloads and practice arrangements.	Netherlands	84
Use of non-health resources through enactment of emergency acts	In all countries considered in this review the Department of Health had the overarching responsibility for public health, however in a public health emergency, additional organisations could be drafted in. In Australia, emergency acts (which are entirely separate from Public Health acts) can also be triggered in the case of pandemics or other public health emergencies Governments can utilise additional resources (e.g. staff and equipment) from non-health departments when the emergency act is triggered	Australia	14
Flexibility in legislation and emergency response	Temporary legislative measures ensured flexibility in maintaining compliance with the IHR. For example, the Biosecurity Act 2015 includes provisions that allow temporary measures under the IHR to be implemented (e.g. establishing a temporary biosecurity monitoring zone at points of entry) in order to enable a response during a public health emergency of international concern.	Australia	86
	The flexibility afforded by temporary legislative arrangements – specifically the option to trigger an emergency act, and the use of less prescriptive legislation – facilitated tailored deployment of powers and timely revision of response plans depending on the severity of the disease.	Australia	14
Testing preparedness	A WHO review of IHR preparedness in Finland highlighted that it is best practice to run preparedness exercises to test legislation and policies for effectiveness.	Finland	87
Fines to ensure compliance	Fines associated with the suite of public health regulations should be sense-tested in practice and in relation to other legislation in order to ensure that the fines provide a disincentive for noncompliance.	Australia	92
Surveillance and notification			

Themes/subthemes	Lesson learned	Location	References
Follow-up after initial notification	When notified cases were followed up, either by public health staff or by an automatic redirection to an enhanced surveillance form, demographic data were more likely to be reported.	Australia	81,82
Timely notification	Timely notification is critical in implementing preventative measures.	Australia	93
	Notification weeks or months after a notifiable disease was irrelevant and a waste of resources for all involved.	Australia	93
	Educating doctors about the importance of complete notifications helped to ensure appropriate and timely notification.	Australia	82
	It was useful to reduce the need for manual entry of notification data during periods of increased demand in order to maintain timely provision of information.	Australia	81
	Electronic reporting and web-based systems can result in more timely notifications than can be achieved by post and fax.	Australia	81
Timely access to data for researchers	Timely access to data for researchers was important in order for research to be up to date and relevant.	Australia	94
Data linkage	In Finland, communicable disease surveillance employs unique personal identifiers to allow linkages to additional data sources.	Finland	87
	Perceived need was considered both a prohibiting and enabling factor for the use of data linkage for communicable diseases; in smaller states and surveillance centres, pertinent information relevant to communicable disease surveillance could easily be gleaned on a case-by-case basis via access to unlinked databases. As a result, data linkage was not a priority in states with a small population. States with larger populations reported a strong desire for data linkage systems in order to support communicable disease surveillance and control activities.	Australia	90
	A lack of resources and skills was a barrier to data linkage for communicable diseases. Linked data systems require dedicated staff with adequate skills in terms of analysis, interpretation, and reporting.	Australia	90
Requirements to notify and provide information	Notification requirements should include all laboratories that conduct testing for diseases and conditions, including chemical laboratories and those monitoring occupational health	Australia	95
	Medical practitioners involved in a patient's care should be required to provide information concerning that person's medical condition, transmission, and risk	Australia	95

Themes/subthemes	Lesson learned	Location	References
	factors regardless of where the notification was made (e.g. laboratory or death certification).{		
	There should be a mechanism for requiring notification by classes of persons other than medical practitioners, as evolving clinical practices mean that other practitioners will increasingly order testing for diseases and conditions.	Australia	[95]
	Private hospitals also need to provide data to the appropriate authority e.g. Communicable Disease Control Branch, in order to ensure a comprehensive national understanding of disease prevalence and progression	Australia	[94]
HIV testing	patients should be named on HIV test request forms in order to prevent patients being given someone else's test results and to prevent the resulting harms.	Australia	[95]
Antimicrobial resistance	There was increased use of antimicrobial medicines in community healthcare centres compared with use in hospital settings.	Australia	[86]
	Detection, surveillance, and stewardship for antimicrobial resistance are mostly focused on hospital structures and these activities be extended to community healthcare centres.	Australia	[86]
Control and treatment			
Requirement for detention and quarantine	Contacts of infected persons need to be contained.	Australia	[95]
Impact of detention and quarantine on the individual	emergency provisions such as quarantine must be used only when strictly necessary and should be balanced with individual rights, in order to avoid impinging unnecessarily on privacy and to prevent human rights violations.	International	[14,16,89,95]
	because public health measures such as quarantine represent a serious infringement on the individual and may compromise an individual's financial well-being, they should be accompanied by financial support for the individual so as to not be an active disincentive for compliance.	International	[13,15]
Increased workload among GPs	During the H1N1 pandemic additional preventative vaccination programme resulted in an increased workload for GPs and practice assistants, and daily work was compromised as a result.	Netherlands	[84]
HIV disclosure and access to data	The NSW Government updated legislation to ensure that clinicians are not unduly constrained in accessing information about a patient's HIV status, in order to provide the best possible care to patients.	Australia	[95]

Themes/subthemes	Lesson learned	Location	References
	The removal of the requirement to disclose HIV status is in line with international best practice.	Australia	98
	previous practice of applying criminal penalties for exposure and non-disclosure of HIV status was counterproductive to public health goal.	Australia	98
Clarifying the responsibilities of all persons with respect to the prevention of infectious diseases	Public Health Acts should contain a provision setting out the responsibilities of all persons with respect to the prevention of infectious diseases.	Australia	95
Minister's power	The Minister should have the power, following a public health inquiry, to direct a person, organisation, or business to notify persons at risk of harm regarding the risk and the measures to mitigate that risk, including testing for diseases.	Australia	95
Allocation of funding			
Adequate resources	Adequate resourcing of local government is necessary if it is to fulfil its responsibilities in public health and in particular to ensure that health planning, implementation, and biennial reporting are carried out.	Australia	99
Allocation of funding	When additional public health tasks are allocated, they must be accompanied by additional budget.	Australia	93
	In Australia the Financial Framework (Supplementary Powers) Regulations 1997 provides specific funding for health emergency planning and response including IHR core capacities the clear allocation of this expenditure provides a strong basis for IHR implementation activities.	Australia	86
	Some health protection problems are not reflected in National Health Service (NHS) structures or funding patterns and that more needs to be done to account for these unexpected demands.	Scotland	100
Impact of budget cuts	Budget cuts have affected two key areas: they have led to a reduction of activities focused on antimicrobial resistance, and to challenges in retaining the laboratory workforce and maintaining reference laboratories.	Finland	87
Defining roles and required expertise			
Roles and expertise of chief medical officers and chief public health officers	The power and authority of the federal and provincial Chief Medical Officers of Health are not clearly defined in legislation, leading to confusion and conflict.	Canada	102
	The Chief Public Health Officer should be a dedicated full-time position , distinct from Chief Medical Officer, to ensure that public health receives the focus and resources	Australia	94,99,104

Themes/subthemes	Lesson learned	Location	References
	needed to guarantee community health outcomes		
	The Chief Public Health Officer should be required to demonstrate public health or environmental health expertise , qualifications, and experience	Australia	[99]
Expertise within health boards	Regional health boards had inadequate expertise regarding health protection. It reported that small health boards in particular faced difficulties in responding to even routine health protection issues due to a lack of capacity and resources.	Scotland	[100]
	Regional health boards were dependent on out-of-hours (on-call) cover from public health consultants whose daytime roles may not include health protection.	Scotland	[100]
Role and expertise of local governments	In South Australia, the roles of public health partner authorities and local councils should be more clearly defined in legislation to avoid confusion and to make sure partnerships are operating as intended.	Australia	.[92,105]
	Local councils may not have the time or expertise to promote public health messaging, particularly on prevention.	Australia	[94]
	Leaving prevention messaging to local councils has led to gaps in the provision of messaging across different councils.	Australia	[94]
	A certain degree of freedom in how roles should be fulfilled was needed so that local authorities could use local knowledge to greater effect.	Australia	[95]
Buy-in to public health roles and responsibilities	In Scotland, there has been a lack of buy-in from some NHS boards regarding the role and remit of Health Protection Scotland. The Health Protection Stocktake Working Group also reported that some boards appear to feel that there may not be a need for the full extent of the surveillance and diagnostic work currently conducted by Health Protection Scotland.	Scotland	[100]
Reliance on external agencies	Scotland relies on services provided by Public Health England, and has also used contractors from the United States of America. Conflicts may arise when trying to prioritise the needs of organisations – for example, those of the Scottish Government against those of the UK Department of Health and the NHS in England.	Scotland	[100]
Working across legislative and organisational boundaries			
Coordination of notification	There should be a coordinated IHR notification framework between the different states in a federated country	Australia	[83]
	During the 2009 H1N1 pandemic in Australia, there was a lack of coordinated information sharing across state boundaries	Australia	[83]

Themes/subthemes	Lesson learned	Location	References
	and this impeded efforts to stop the spread of the virus		
	Jurisdictional clarity should be addressed when developing or amending our public health laws to ensure that there are clear and transparent lines of responsibility and reporting.	International	13
Information sharing	Legislative barriers to information sharing can impact the timeliness, flexibility, and quality of international reporting under the IHR	Canada	85
	In Canada, no formal process exists for the interjurisdictional sharing of data and currently is reliant on informal collegial relationships between states.	Canada	85
	Gaps in the pan Canadian legal foundation have the potential to undermine the capacity to detect public health events affecting multiple jurisdictions.	Canada	85
	In Australia there is a need for legislation to facilitate the sharing of information between agencies.	Australia	86
	Australia's federated political system is a barrier to data linkage, which could improve the completeness of items in the National Notifiable Diseases Surveillance System.	Australia	90
	In Scotland there was a perception that information was not always shared as early as health boards would have liked, along with a sense of conflicting priorities.	Scotland	100
Consistency across regions	In Scotland there was reported variation in local health protection arrangements between health boards leading to non-standardised approaches across the country.	Scotland	100
	Prescribed templates, guidance documents, and information circulars could be used to ensure consistency across state.	Australia	92
Updating tools and documents under regulation	Effectiveness of regulations could be significantly enhanced by updating their subordinate tools and supporting documents	Australia	92
	Some regulations are currently providing links and references to organisations that no longer exist.	Australia	92
Decentralisation and responding to public health emergencies	A decentralised system can allow for more effective distribution of resources and shorter lines of communication in response to emergencies	Australia	14
	A devolved administrations working closely together can enhance the response to pandemic	Scotland	88

Themes/subthemes	Lesson learned	Location	References
Role of government	There is a need to ensure that operational activity takes place at the appropriate level and is subject to appropriate governance.	Scotland	100
	During pandemics, decision-making was too slow at Scottish and UK government level.	Scotland	100
Role of the national public health body	In the Netherlands during an outbreak, the National Institute for Public Health and the Environment is, among others, responsible for the coordination and provision of information to patients and professionals in case of an infectious disease outbreak.	Netherlands	84
	The National Institute for Public Health and the Environment is part of an outbreak management team and attends managerial coordination meetings.	Netherlands	84
	The creation of the Public Health Agency of Canada strengthened federal leadership and capacity in public health, both in preparedness and response to health emergencies.	Canada	85
Public health acts reinforce partnerships and collaboration	the Public Health etc. (Scotland) Act 2008 reinforced existing partnerships.	Scotland	100
	Public health legislation is a driving force facilitating collaborative planning within Australian states that have implemented such legislation.	Australia	91
Siloed working practices	The Health Protection Stocktake Working Group reported a distinct lack of a single integrated and coherent public health system in Scotland.	Scotland	100
Public Trust			
Transparency	While detention or quarantine are necessary in limited cases to protect public health, they represent an infringement of liberty, and the Ministry of Health should be transparent in terms of the numbers of such orders made	Australia	95
Community engagement	Engagement with affected communities, such as those with HIV, builds trust and community confidence in the public health system.	Australia	14,95
Respecting individual rights and privacy	In Australia, community confidence can be retained by showing regard for the civil rights of citizens	Australia	14
	Protection from subpoena is important for all information held under the Public Health Act to ensure people are satisfied their data is being used only for public health purposes.	Australia	95
	Clarification of what information can be collected and how the privacy of that information will be safeguarded is an	International	13

Themes/subthemes	Lesson learned	Location	References
	important aspect of maintaining public trust in public health		
Minimally invasive containment and compensation	In Australia it was found that an appropriate duration of emergency powers holds public confidence	Australia	[14]
	Introducing compensation measures into pandemic plans would increase trust in government and public health institutions	Australia	[15]
Recognising culture	Recognising the importance of culture and the need for national legislation to reflect the values of the population can help to ensure that public health legislation respects the interests and dignity of the individuals it affects	International	[13]

5 Discussion and conclusion

5.1 Overview of findings: legislation overview

The legislation implementing the IHR ranged from overarching national public health legislation to state/provincial legislation under federal jurisdiction. In this review, we identified five European unitary states, two federal countries, and seven states/provinces, and from these jurisdictions, 49 relevant legislative instruments were included. Altogether, 2,090 sections of text were extracted and mapped to the categories identified in Table 3 based on their content.

As described previously, the categories for extraction were devised based on the IHR core capacities, as well as on some recommendations from the DOH (see section 2.6.1). While all of the public health legislation that was studied addressed the IHR core capacities, a number of elements were unique to certain jurisdictions. For example, Australian legislation contains a sunset clause, whereby legislative instruments must be reviewed after a specified period of time, and Croatian legislation states that workers in the healthcare, water, and food sectors must undergo regular medical testing.[64] In general, the organisation of public health structures was relatively similar throughout each of the jurisdictions studied, with the foremost authority for public health being either the Minister for Health or equivalent, or a suitably qualified Chief Officer of Public Health. This is similar to the Irish DOH, whereby the Chief Medical Officer acts as the central medical authority for public health matters.

Analysing the number of mapped sections allowed us to uncover the characteristics of the legislation and to identify the majority focus of each legislative instrument. It also allowed us to estimate overall trends in the relative importance of each category. For example, control and treatment measures were by far the most numerous. With 546 sections, the category 'control and treatment' represented 26% of the overall legislation. To put this into perspective, the second most represented category, 'emergency preparedness and prevention', was assigned to 335 sections, a difference of 201 sections. This indicates the importance of including robust control and treatment measures in national legislation. On the other hand, the category 'laboratory' was least represented overall, despite being an IHR core capacity. There were no sections pertaining to the designation of national reference laboratories.

The manner in which the IHR was implemented differed based on the specific needs of each region studied. Some categories were adopted into legislation largely through regulations, for example 'surveillance and notification' in British Columbia and 'resources' in Manitoba. This may suggest a reactive approach which could be useful in legislating measures that require flexibility (the importance of flexibility in legislation is described in the context of emergency preparedness and prevention measures in Section 4.4.1.4). Other categories, such as 'ministerial and political interface', were adopted almost entirely through the acts studied. This could be due to the fact that this category legislates for the power to make regulations, and therefore needs to be outlined in the overarching legislation for the purposes of future adaptability. Interestingly, multiple categories, including 'ministerial and political interface', were not legislated for in Portuguese legislation. In 2008, Portugal implemented the IHR through publication of the text in English and in Portuguese in the Official Gazette of Portugal, and it supplemented this with more specific measures in Law No. 81/2009 of August 21. We did not identify any regulations made under this law, nor did the law describe the regulation-making powers of the Minister for Health.

Language proved to be a significant barrier in the identification and analysis of some of the legislative instruments identified. Some sections of the health legislation could not be mapped to a particular category, particularly where the content deviated from infectious or communicable diseases. For example, the Public Health etc. (Scotland) Act 2008 contained several sections on sunbed use, as well as a regulation entirely devoted to sunbeds.[73,74] The Public Health and Wellbeing Act 2008 from Victoria, Australia, legislated for various social determinants of health, as well as beauty therapies and registration of premises for accommodation.[37] Multiple sections of the Dutch Decree of 27 October 2008, laying down new requirements regarding public health matters (Public Health Decree) focused on healthcare rights of young people, and the legislation was therefore largely unmapped.[69]

Gaps in legislation are important, as they highlight country-specific policy needs which may or may not need to be addressed at a future stage. It should be noted that some jurisdictions included in this

review have signalled the intention to update their legislation. For example, in Scotland, new legislation has been drafted to reform public health and to introduce a new governing body, Public Health Scotland. This body is expected to be established by the end of 2020, once legislative requirements have been met.[106] Information on expected updates to the Scottish health legislation could be important for the purposes of using this review to inform the Irish framework, and such information should be considered by the DOH.

As it currently stands, only 70% of WHO state parties have implemented the IHR to a satisfactory standard.[4] Identifying legislation that has incorporated the IHR core capacities is an exercise in identifying areas which may need improvement in order to ensure implementation of consistent international disease control and coordination measures. As stated by the WHO: "Until all sectors are on board with the IHR, no country is ready."[107(p2)]

5.2 Overview of findings: lessons learned

Following the identification of legislation and analysis of all sections, our aim was to identify the lessons learned from the experience of implementing the IHR. This was done through a systematic review of papers, reviews, and other publications that critically evaluated the relevant legislation. Usage of the International Labour Organization's definition of a lesson learned (as described in Section 2.1.2) enabled consistency in identification of the lessons described in this review. Following identification and validation of the lessons learned, the evidence was synthesised thematically and categorised under seven themes.

Overall, three of the seven themes closely aligned with the IHR core capacities and the categories described in Table 3. This highlights the importance of clearly addressing these components in legislation. The most prominent theme to emerge from the lessons learned was that facilitating the coordination of work across legislative and organisational boundaries is key to successful management of disease surveillance and emergency response. Decentralisation, for example, was shown to be both a positive and negative factor in infectious disease control: it facilitates rapid local responses, yet can act as a barrier to sharing information.

The lessons in this review identified that when additional public health tasks are allocated, they must be accompanied by additional budget allowances. As described at section 4.4.4.3, budget cuts in Finland have created challenges in retaining the laboratory workforce and ensuring maintenance of reference laboratories.[87] Where budget constraints limit a region's ability to respond appropriately to an infectious disease threat, the overall effectiveness of the IHR is threatened. It is clear, therefore, that funding for vital IHR activities needs to be ring-fenced, with clear boundaries being provided for resource allocation.

In several countries, the national public health body has been shown to play a pivotal role in coordinating the response to public health emergencies. A key aspect of the ability to undertake a tailored response to novel emerging disease threats is the principle of flexibility in legislation. This can be achieved through outlining regulation-making powers and ensuring the ability to carry out continuous updates to the legislation as new needs emerge. Demonstrating the importance of adaptability, some of the lessons learned described in this report have been incorporated into legislation through amendments to the public health acts. It should be noted, however, that vague legislation may lead to misinterpretation, and so appropriate legal safeguards should be put in place to avoid confusion.

Control and treatment measures for disease management can occasionally require quarantine of individuals or groups, as well as the issuance of public health orders and mandatory medical testing. As far as possible, the individual rights of the person should be respected in all control and response measures in order to ensure public trust, and control measures should be as minimally intrusive as reasonably possible. Where people's rights must be infringed upon for the purposes of protecting public health, it is important to exhibit transparency while also respecting the privacy of the individual.

5.3 Strengths and limitations of this evidence review

Systematic methods were used to identify and analyse data for both questions considered in this evidence review, and this is a key strength of the research. As Question 1 involved the identification of legislative instruments rather than research studies, the HRB was unable to follow traditional systematic review methods to answer this question. However, all of the relevant data were systematically identified. For Question 2, systematic review methods were followed throughout the entire review process.

The IHR, as an exemplar of a regulatory mechanism for preventing and responding to the international spread of disease, can only truly be tested by a major disease outbreak, and the same is true of any resulting public health legislation. As there have only been three notable outbreaks since 2005 (the H1N1 pandemic in 2009, the West African Ebola outbreak from 2014 to 2016) and the 2019 Ebola outbreak in the Democratic Republic of the Congo, the lessons are limited. In order to overcome this limitation, the WHO advises that it is best practice to run preparedness exercises to test legislation and policies for effectiveness.

5.4 Future research

This evidence review should be updated periodically to identify new lessons learned and subsequent changes to legislation. Any lessons learned from the experience of future disease outbreaks should be considered.

5.5 Conclusions

There is a complex network of legislation underpinning the management of infectious diseases, with the IHR core capacities being a global standard. The measures taken to implement these core capacities differed between each of the jurisdictions studied, resulting in a diverse range of legislative instruments from which several key lessons were identified. These lessons should be supplemented with further evidence once their effectiveness has been properly tested on an international scale.

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Appendix A Legislative categories requested by DOH

The legislative categories requested by the DOH alongside the categories included in this report and WHO core capacities are outlined below. We started with the category title and associated terms from the DOH mapped these to WHO core capacities and relabeled the category title from the DOH where this was necessary to reflect what was covered in the WHO core capacity as well.

Outcome	WHO core capacity	Category title from DOH	Associated terms from DOH
Objectives	N/A	Not given by DOH	N/A
Scope	N/A	Not given by DOH	N/A
Emergency preparedness and prevention	Preparedness; risk communication (5 and 6)	Originally two categories Prevention and IHR and Emergency planning	• Measures to prevent infectious diseases – screening, vaccination, communications, food or water-borne measures (e.g. private wells, food production). • Responsibilities of non-health agencies (e.g. water authority) • Is an all-hazards approach mentioned/taken? • Are there specific sections on emergency preparedness (versus emergency response)? • Are specific functions for Focal Points/Competent Authority / Authorities identified? • Are measures to be taken in the event of a Public Health Emergency (of International Concern) identified? • Are specific measures for alerting or being alerted to a threat identified? • What is said about points of entry? • What is said about cooperation and information sharing between agencies? • Port Health Authority, Security, Cooperation, Reporting, Surveillance, Contact / Vector Tracing, Detention, Protocols / Procedures, Vermin, Disinfection, Facilities, Training, Health and Safety, Health Security, Cross-Border Health, Penalties, Emergency Services, Inter-Agency Cooperation, Taskforce, Risk (Assessment), Equipment, Funding, Ministerial / Political Interface, Authority, Functions / Powers / Duties, Compensation, , Repatriation, Casualties, Triage, Communications, Protocols / Procedures, Coordination, Reporting, Rostering

Outcome	WHO core capacity	Category title from DOH	Associated terms from DOH
Vaccination	N/A	Vaccination	• Measures to increase or mandate uptake • Compensation for vaccine injury • • Vaccination of healthcare workers • Emergency measures – e.g. vaccination of Health Workers • Research, (Cold) Storage, Procurement, Assurance / Validation, Ministerial Approval, Distribution, Children / Schools, Programmes, Labelling, Stockpiling, Prescription / Certification, Health-Workers, Prioritisation, Funding, Indemnification, Public Health (Measures), Public Interest / Good
Control and treatment	Response (4)	•	• Measure to prevent the spread of infectious diseases. • Imposition of restrictions or requirements and appeals mechanisms against same • medical examination • Treatment • Offences listed • Detention. • Emergency Response. • Contact tracing/Vector tracing. • Outbreak response. • Powers of statutory officers (see below). • Responsibilities of non-health agencies (e.g. water authority) • Measures to provide treatment for free in public interest. • Quarantine. • Mandatory treatment • Compensation for exclusion from work on Public Health grounds.

Outcome	WHO core capacity	Category title from DOH	Associated terms from DOH
			• Dealing with prolonged exclusion from crèche (i.e. Chronic shedders of VTEC).
Surveillance and notification	Surveillance and national focal point communication	•	• Communications between healthcare professionals or organisations about cases or outbreaks – who has to notify about a disease, who gets notified, and how does this happen • Are there specific sections on GDPR/data protection? • Are there sections which differentiate between "research" and information gathering for the purposes of surveillance or public health action? • How does surveillance data get reported either locally or annually? • Databases, Registration, Recording, Monitoring, Annual or local reporting, International Assistance, Rostering, Help-Line, Classification, Protocols / Procedures, • Focal Point
Laboratory	Laboratory (8)	•	• Responsibilities of laboratories • Designation of reference laboratories and/or categorisation of laboratories
Officers and designated offices	Coordination and national focal point communications (2)	•	• Statutory Officers / Appointed Officers / Medical Officers of Health / Public Health Officers – o Functions, Powers, Duties, Roles, Responsibilities, Methods of Appointment, Technical Competence / Training of, Reporting Arrangements, Authority, Supports Provided to (e.g. police support), Inspection, Access Rights, Offences / Penalties, Hierarchy / Grading, Sign-Posting (of Infected Locations), Disinfection, Inspection
Ministerial/Political Interface	National legislation, policy and financing (1)		Regulations / Regulation-making powers, Parliament (i.e. reporting to / consultation with), Reports, Statistics, Decisions, Appointment (of Officers), Agencies, Governance, Escalation, Government, Media / Press Office, Accountability, Funding, Coordination, Emergency Planning, Delegation, Senior Management, Secretary / Director General, Authority, Constitution, Consultation

Outcome	WHO core capacity	Category title from DOH	Associated terms from DOH
Resources	National legislation, policy and financing; human resources (1 and 7)	•	• Funding, • Facilities, • IT systems and software, • Technology, • Approval, • Procurement, • Audit, • Accountability, • Reporting, • Consultancy, • Recruitment
Mortuaries and dead bodies	N/A		-
Enactment date	N/A		Date to become law
Appeals and liability	N/A		Updating, Modernising, Repealing, Revoking, Inadequate, Fit for Purpose, Implementing, Transposing, Weaknesses, Reinforcing, Legal Cases, Courts, Penalty Provisions, Out of Date, Best Practice.

Appendix B Overview of legislative instruments

Countries

Country	Country type	Name of legislative instrument	Act or regulations	Majority focus
Australia	Federal state	National Health Security Act 2007	Act	Surveillance and notification (28.3%)
Australia	Federal state	National Health Security Regulations 2018	Regulations	Surveillance and notification (30.4%)
Australia	Federal state	Biosecurity Act 2015	Act	Emergency preparedness and prevention (41.3%)
Australia	Federal state	Biosecurity (Human Health) Regulation 2016	Regulations	Emergency preparedness and prevention (75%)
Canada	Federal state	Public Health Agency of Canada Act	Act	Officers and designated offices; ministerial and political interface (35.3% each)
Canada	Federal state	Emergency Management Act	Act	Ministerial and political interface (50%)
Canada	Federal state	Quarantine Act	Act	Control and treatment (31.6%)
Canada	Federal state	Quarantine Regulations	Regulations	Emergency preparedness and prevention (100%)
Croatia	Unitary state	Act on the Protection of the Population Against Communicable Diseases	Act	Control and treatment (21.7%)
Finland	Unitary state	Communicable Diseases Act	Act	Control and treatment (26.8%)
Finland	Unitary state	Government Decree on communicable diseases	Regulations	Surveillance and notification (43.8%)
Finland	Unitary state	Decree of the Ministry of Social Affairs and Health on vaccinations	Regulations	Vaccination (88.9%)
The Netherlands	Unitary state	Public Health Act 2008	Act	Control and treatment (23.0%)
The Netherlands	Unitary state	Decree of 27 October 2008, laying down new requirements regarding public health matters	Regulations	Other – rights to healthcare for young people (38.1%)

		(Public Health Decree)		
Portugal	Unitary state	Law No. 81/2009 of August 21	Act	Surveillance and notification; officers and designated offices (25.9% each)
Scotland	Devolved (*de jure* unitary state)	Public Health etc. (Scotland) Act 2008	Act	Control and treatment (58.4%)
Scotland	Devolved (*de jure* unitary state)	Public Health etc. (Scotland) Act 2008 (Sunbed) Regulations 2009	Regulations	Other – sunbed use (50%)
Scotland	Devolved (*de jure* unitary state)	Public Health etc. (Scotland) Act 2008 Designation of Competent Persons Regulations 2009	Regulations	Resources (66.7%)

States and provinces

Region name	Region type	Name of legislative instrument	Act or regulations	Majority focus
New South Wales	Australian state	Public Health Act 2010	Act	Control and treatment (22.8%)
South Australia	Australian state	South Australian Public Health Act 2011	Act	Officers and designated offices (29.0%)
South Australia	Australian state	South Australian Public Health (Fees) Regulations 2019	Regulations	Resources (100%)
South Australia	Australian state	South Australian Public Health (General) Regulations 2013	Regulations	Emergency preparedness and prevention (45.5%)
South Australia	Australian state	South Australian Public Health (Legionella) Regulations 2013	Regulations	Emergency preparedness and prevention (66.7%)
South Australia	Australian state	South Australian Public Health (Notifiable and Controlled Notifiable Conditions) Regulations 2012	Regulations	Surveillance and notification (66.7%)
South Australia	Australian state	South Australian Public Health (Wastewater) Regulations 2013	Regulations	Emergency preparedness and prevention (100%)
Victoria	Australian state	Public Health and Wellbeing Act 2008	Act	Control and treatment (30.9%)

Victoria	Australian state	Public Health and Wellbeing Regulations 2009	Regulations	Emergency preparedness and prevention (23.3%)
Western Australia	Australian state	Public Health Act 2016	Act	Emergency preparedness and prevention (20.4%)
Western Australia	Australian state	Public Health Regulations 2017	Regulations	Surveillance and notification (63.2%)
Western Australia	Australian state	Mandatory Testing (Infectious Diseases) Act 2014	Act	Control and treatment (75.9%)
British Columbia	Canadian province	Public Health Act	Act	Control and treatment (36.3%)
British Columbia	Canadian province	Reporting Information Affecting Public Health Regulation	Regulations	Surveillance and notification (76.5%)
British Columbia	Canadian province	Code of Practice for Soil Amendments	Regulations	Emergency preparedness and prevention (60.0%)
British Columbia	Canadian province	Health Hazards Regulation	Regulations	Emergency preparedness and prevention (83.3%)
British Columbia	Canadian province	Information Regulation	Regulations	Surveillance and notification (50.0%)
British Columbia	Canadian province	Public Health Impediments Regulation	Regulations	Surveillance and notification (66.7%)
British Columbia	Canadian province	Public Health Inspections and Orders Regulation	Regulations	Control and treatment (80.0%)
British Columbia	Canadian province	Vaccination Status Reporting Regulation	Regulations	Vaccination (100%)
Manitoba	Canadian province	The Public Health Act	Act	Control and treatment (33.3%)
Manitoba	Canadian province	Reporting of Diseases and Conditions Regulation	Regulations	Surveillance and notification (71.4%)
Manitoba	Canadian province	Dead Bodies Regulation	Regulations	Mortuaries and dead bodies (88.9%)
Manitoba	Canadian province	Disease Control Regulation	Regulations	Control and treatment (54.5%)
Manitoba	Canadian province	Health Hazards Regulation	Regulations	Control and treatment (57.1%)

Manitoba	Canadian province	Immunization Regulation	Regulations	Surveillance and notification (50.0%)
Manitoba	Canadian province	Information Sharing Regulation	Regulations	Officers and designated offices (75.0%)
Manitoba	Canadian province	Public Health Personnel Regulation	Regulations	Officers and designated offices (42.9%)
Newfoundland and Labrador	Canadian province	Public Health Protection and Promotion Act	Act	Control and treatment (30.6%)
Newfoundland and Labrador	Canadian province	Public Health Protection and Promotion Regulations	Regulations	Control and treatment (36.4%)

Appendix C Search strategies

A. Search Results

Country	Total results	Of which Database searches	Of which Grey Literature searches
Australia	435	329	106
Canada	218	184	34
Croatia	86	68	18
Finland	22	14	18
Netherlands	528	488	40
Poland	221	187	34
Portugal	208	184	24
Scotland	103	62	41

Database/Country	FIN	SCO		AUS3*	AUS2*	CAN3	CRO	NET	POL	POR
MEDLINE	14	20		27	47	17		131	55	48
Scopus	21	30		17	19	11	12	60	15	33
Web of Science	43	30		25	31	14	9	70	35	41
LegalTrac	11	2		23	6	22	4	17	2	3
HeinOnline	75	78		62	132	137	36	313	79	93
Total Database	22	103		329		184	68	488	187	184
Total Grey Lit	18	41		106		34	18	40	34	24
Total deduplicated	22	103		435		218	86	528	221	208

* Database searches for Australian publications were carried out in two sections:

B. Bibliographic database searches

1. Ovid MEDLINE: Scotland, Finland
2. Ovid Medline: Australia (New South Wales, Victoria, South Australia, Western Australia, Queensland), Canada (Manitoba, Newfoundland and Labrador, British Columbia), Poland, Portugal, Croatia, Netherlands

Databases/platforms used: Ovid MEDLINE, Elsevier Scopus, Thomson Web of Science, HeinOnline and LegalTrac

The Ovid MEDLINE search strategy is described here. Search strategies for other databases used are available on request.

1. Ovid MEDLINE: Public health legislation in Scotland and Finland		
Database	Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to July 29, 2019	
Search Date	30/07/2019	
Geographic limits	Scotland, Finland	
Date limits	2005-Current	
Topic	Search terms	Results
Legislation	1. ("international health regulations" or "international health regulation").af.	465
	2. exp International Health Regulations/	7
	3. (IHR adj3 (implementation or focal point$ or core capacit$ or review or JEE)).mp.	51
	4. joint external evaluation$.af.	28
	5. (Reglamento Sanitario Internacional or "Regulamento Sanitário Internacional" or "Międzynarodowych Przepisów Zdrowotnych 2005" or "Règlement sanitaire international" or "RSI 2005" or "Internationale Gesundheitsvorschriften" or Regolamento sanitario internazionale or "Regulamentul sanitar internațional din" or Internasjonale helseforskrifter or "Internationella hälsoreglementen" or "kansainväliset terveyssäännöt" or Internationale sundhedsbestemmelser or Rahvusvahelised tervishoiueeskirjad or internasionale gesondheidsregulasies).mp.	14
	6. (IHR2005 or "IHR 2005" or "IHR-2005" or "IHR (2005)" or ("health regulations" adj5 "2005")).mp.	189
	7. or/1-6	493
	8. legislation.pt.	1670
	9. exp Legislation as Topic/	156631
	10. exp Government Regulation/	20737
	11. *Jurisprudence/	19626
	12. government regulation$.ab,ti.	919
	13. international regulation$.ab,ti.	473
	14. exp International Law/	52
	15. (law or laws or legislation or directive* or legal).ti.	63835
	16. (national policy or national policies).ab,ti.	3700
	17. (international policy or international policies).ab,ti.	574

	18. Bioterrorism/lj [Legislation & Jurisprudence]	219
	19. Communicable Disease Control/lj [Legislation & Jurisprudence]	916
	20. Disease Outbreaks/lj [Legislation & Jurisprudence]	266
	21. Global Health/lj [Legislation & Jurisprudence]	198
	22. Security Measures/lj [Legislation & Jurisprudence]	623
	23. ((law or laws or legislation) adj2 (public health or infectious disease or infection control or global health)).ti,ab.	910
	24. or/8-23	242014
	25. 7 or 24	242371
Public health/infectious disease/communicable disease	26. exp Communicable Disease Control/	325248
	27. exp Disease Outbreaks/	89719
	28. exp Population Surveillance/	65451
	29. exp Communicable Diseases/	34096
	30. exp Zoonoses/	16075
	31. exp Pandemics/	4716
	32. exp Disease Reservoirs/	15321
	33. exp Global Health/	43594
	34. exp One Health/	178
	35. exp Public Health Surveillance/	2623
	36. quarantin$.ab,ti.	4238
	37. communicable disease$.mp.	59845
	38. infectious disease$.ab,ti.	72551
	39. disease outbreak$.ab,ti.	5559
	40. pheic$.ab,ti.	47
	41. pandemic$.ab,ti.	23154
	42. public health emergenc*.ab,ti.	1791
	43. (biosecurity or biosafety).ab,ti.	5484
	44. population surveillance.ab,ti.	265
	45. public health surveillance.ab,ti.	1777
	46. event-based surveillance.ab,ti.	49
	47. infection control.ti.	5333
	48. (Global health or GHSA).ab,ti.	16831
	49. (disease notification or exposure notification).ab,ti.	194
	50. or/26-49	631237
Legislation AND Public health/infectious disease/communicable disease	51. 25 and 50	9836
Date limit	52. limit 51 to yr="2005 -Current"	

Finland	53. Finland/ or (Finland or Finnish or Finn or Suomi or Suomen tasavalta or Helsinki or Aland Islands or Valtioneuvosto or "Sosiaali- ja terveysministeriö").mp.	52250
Scotland	55. exp Scotland/ or (Scotland or Scottish or Edinburgh or Alba or "Ayrshire & Arran" or "Dumfries & Galloway" or Fife or Forth Valley or Grampian or "Greater Glasgow & Clyde" or "NHS Highland" or Lanarkshire or Lothian or Orkney or Shetland or Tayside or Eileanan Siar or Western isles).mp.	46816
Legislation AND Public health/infectious disease/communicable disease AND Finland	**56. 52 and 53**	**14**
Legislation AND Public health/infectious disease/communicable disease AND Scotland	**58. 52 and 54**	**20**

3. **Ovid MEDLINE: Public health legislation in Australia, Canada, Croatia, Netherlands, Poland, Portugal**	
Database	Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to August 12, 2019
Search Date	16/08/2019
Geographic limits	Australia (New South Wales, Queensland, South Australia, Victoria, Western Australia) Canada (British Columbia, Manitoba, Newfoundland and Labrador) Croatia, Netherland, Poland, Portugal
Date limits	2005-Current

Concept	Search number	Search terms	Number of results
Legislation	1	("international health regulations" or "international health regulation").af.	468
	2	exp International Health Regulations/	7
	3	(IHR adj3 (implementation or focal point$ or core capacit$ or review or JEE)).mp.	51
	4	joint external evaluation$.af.	28
	5	(Reglamento Sanitario Internacional or "Regulamento Sanitário Internacional" or "Międzynarodowych Przepisów Zdrowotnych 2005" or "Règlement sanitaire international" or "RSI 2005" or "Internationale Gesundheitsvorschriften" or Regolamento sanitario internazionale or "Regulamentul sanitar internațional din" or Internasjonale helseforskrifter or "Internationella hälsoreglementen" or "kansainväliset terveyssäännöt" or Internationale sundhedsbestemmelser or Rahvusvahelised tervishoiueeskirjad or internasionale gesondheidsregulasies).mp.	14
	6	(IHR2005 or "IHR 2005" or "IHR-2005" or "IHR (2005)" or ("health regulations" adj5 "2005")).mp.	191
	7	legislation.pt.	1670
	8	exp Legislation as Topic/	156806
	9	exp Government Regulation/ or government regulation*.ab,ti.	21550

	10	*Jurisprudence/	19629
	11	exp International Law/ or international regulation$.ab,ti. or international law$.ab,ti.	1017
	12	(law or laws or legislation or directive* or legal).ti.	63888
	13	(national policy or national policies).ab,ti.	3705
	14	(international policy or international policies).ab,ti.	575
	15	Bioterrorism/lj [Legislation & Jurisprudence]	219
	16	Communicable Disease Control/lj [Legislation & Jurisprudence]	918
	17	Disease Outbreaks/lj [Legislation & Jurisprudence]	266
	18	Global Health/lj [Legislation & Jurisprudence]	198
	19	Security Measures/lj [Legislation & Jurisprudence]	625
	20	((law or laws or legislation) adj2 (public health or infectious disease or infection control or global health)).ti,ab.	911
	21	(public health act or public health acts).mp.	108
	22	or/1-21	242953
Public Health	23	exp Communicable Disease Control/	325939
	24	exp Disease Outbreaks/	89884
	25	exp Population Surveillance/	65658
	26	exp Communicable Diseases/	34178
	27	exp Zoonoses/	16128
	28	exp Pandemics/	4721
	29	exp Disease Reservoirs/	15350
	30	exp Global Health/	43727
	31	exp One Health/	180
	32	exp Public Health Surveillance/	2683
	33	quarantin$.ab,ti.	4245
	34	communicable disease$.mp.	60003
	35	infectious disease$.ab,ti.	72720
	36	disease outbreak$.ab,ti.	5584
	37	pheic$.ab,ti.	47
	38	pandemic$.ab,ti.	23195
	39	public health emergenc*.ab,ti.	1802
	40	(biosecurity or biosafety).ab,ti.	5507
	41	population surveillance.ab,ti.	265
	42	public health surveillance.ab,ti.	1783
	43	event-based surveillance.ab,ti.	49
	44	infection control.ti.	5337
	45	(Global health or GHSA).ab,ti.	16918
	46	(disease notification or exposure notification).ab,ti.	194
	47	("public health Act" or "public health Acts" or "public health law" or "public health legislation" or "public health instruments" or "national legislation" or	7677

		"international legislation" or "national law" or "international law" or "national policy" or "national policies" or "healthcare legislation" or "healthcare regulations" or "health regulation" or "health regulations" or "health directive" or "health directives" or "national directive" or "international directive" or "EU directive" or "EU directives" or "EU regulation" or "WHO directive" or "WHO regulation").mp.	
	48	or/23-47	639072
Legislation and Public Health	49	22 and 48	14617
Date limit	50	limit 49 to yr="2005-Current"	7971

Search terms for each country added to the Legislation and Public Health Ovid MEDLINE search

Concept	Search number	Search terms	Number of results
Australia: New South Wales and Victoria			
Country/region	51	New South Wales/ or Victoria/ or (New South Wales or Melbourne).mp. or (Sydney and Australia).mp. or (Victoria and Australia).mp.	36884
Country-specific legislation	52	("public health Act 2010 NO 127" or "public health act 2010" or "public health Act no 127" or "Public Health and Wellbeing Act 2008").mp.	3
	53	51 or 52	36884
	54	**50 and 53**	**47**
Australia: Queensland, South Australia, Western Australia			
Country/region	51	Queensland/ or South Australia/ or Western Australia/ or (Queensland or Brisbane or South Australia or Western Australia or Perth).mp. or (Adelaide and Australia).ab,ti.	29298
Country-specific legislation	52	("public health Act 2005" or "Public health act 2011" or "Public health act 2016").mp.	2
	53	51 or 52	29298
	54	**50 and 53**	**27**
Canada: British Columbia, Manitoba, Newfoundland and Labrador			
Country/region	51	Manitoba/ or "Newfoundland and Labrador"/ or British Columbia/ or (Manitoba or Winnipeg or British Columbia or "Newfoundland and Labrador" or "public health protection and promotion act").mp. or (Victoria and Canada).ab,ti. or ("St. John's" and Canada).ab,ti.	20627
	52	**50 and 51**	**17**
Poland			
Country/region	51	Poland/ or (Poland or Polska or Polish or "Polish People's Republic" or Warsaw or "Ministerstwo Zdrowia").mp.	62447
	52	**50 and 51**	**55**
Portugal			
Country/region	51	Portugal/ or (Portugal or Portuguese or Portuguesa or "português" or Lisbon or "Ministério da Saúde").mp.	29027

	52	50 and 51	48
Croatia			
Country/region	51	Croatia/ or (Croatia* or Yugoslavia or Hrvatska or Zagreb or Hrvatsk* or "Ministarstvo zdravstva").mp.	19630
	52	50 and 51	15
Netherlands			
Country/region	51	Netherlands/ or (Netherlands or Nederland$ or Holland or Nederland or Dutch or Amsterdam or Rijksoverhei).ab,ti.	103107
	52	50 and 51	131

C. Grey Literature searches

1. Australia
2. Canada
3. Croatia
4. Scotland
5. Finland
6. Poland
7. Portugal
8. Netherlands

Note: Grey literature searches included searches of websites considered likely to be relevant, e.g. national Departments of Health and research and public health institutions. Google and Google Scholar results are also presented – the first 100 results, sorted by the default setting, were examined. Material in languages other than English were not included. Works published prior to 2005 were also not included, but no exclusion filters were used for either of these criteria as the results numbers were low enough in general to screen manually. Using filters can eliminate useful results inadvertently, even more so with the limited searches available with non-database resources.

Search dates:

FIN SCO:

AUS CRO NET CAN POLPOR: 27/08/2019

1. Australia

Australia			
Organization	Website address	Search terms	**Relevant results**
Australian Government, Department of Health	https://www.health.gov.au/	Public health act Health and wellbeing act	1
Public Health Association Australia	https://www.phaa.net.au/	Public health act Health and wellbeing act	0
Queensland Government: Queensland Health	https://www.health.qld.gov.au	Public health act	0
Queensland Government: Queensland Health: Reports	https://www.health.qld.gov.au/research-reports/reports	Public health act	0
Queensland Law Reform Commission	https://www.qlrc.qld.gov.au/	Public health act	0
Queensland Government	https://www.qld.gov.au	Public health act	0
Government of South Australia. SA Health	https://www.sahealth.sa.gov.au	Public health act	1
South Australia Legislation	https://www.legislation.sa.gov.au	Public health act	1
Auditor-General's Department	https://www.audit.sa.gov.au	Public health act	0
NSW Government. NSW Legislation	https://www.legislation.nsw.gov.au	Public health act	0
NSW Government. Health	https://www.health.nsw.gov.au/Pages/default.aspx	Public health act	3

NSW Government. Law Reform Commission	https://www.lawreform.justice.nsw.gov.au/	Public health act	0
Government of Western Australia. Western Australian Legislation	https://www.legislation.wa.gov.au	Public health act	0
Government of Western Australia. Department of Health	https://ww2.health.wa.gov.au	Public health act	0
Government of Western Australia. Department of Health. Health WA.	https://healthywa.wa.gov.au	Public health act	0
Law Reform Commission of Western Australia	https://www.lrc.justice.wa.gov.au/	Public health act	0
Victoria State Government. Health.vic	https://www2.health.vic.gov.au/	Public health and wellbeing act	0
Municipal Association of Victoria	http://www.mav.asn.au	Public health and wellbeing act	0
Victoria State Government. Health and Human Services	https://www.dhhs.vic.gov.au/	Public health and wellbeing act	0
Google.com searches: First 100 results			
"New South Wales" "public health act" 2005-2019		About 1,330 results (0.24 secONDS)	3
NSW "public health act"		About 89 results (0.51 seconds)	7
Queensland "public health act"		About 86 results (0.56 seconds)	10
Victoria Australia "Health and Wellbeing Act "		About 18,600 results (0.50 seconds)	21
"Western Australia" "Public Health Act"		About 95 results (0.87 seconds)	17
"south Australia" "public health act"		about 46,600 results (0.30 seconds)	13
Google Scholar searches: First 100 results			
"New South Wales" "public health act" 2005-2019		about 1,330 results (0.05 seconds)	3
NSW "public health act" 2005-2019		About 1,190 results (0.11 seconds)	1
Queensland "public health act" 2005-2019		About 1,030 results (0.04 seconds)	8
Victoria Australia "Health and Wellbeing Act "		About 282 results (0.11 seconds)	11
"Western Australia" "Public Health Act" 2005-2019		About 618 results (0.20 seconds)	3
"south Australia" "public health act" 2005-2019		About 676 results (0.19 seconds)	3
Australia: Total Grey literature search results			
			106

2. **Canada**

Canada			
Organization	Website address	Search terms	Relevant results
Government of Canada. Health Canada	https://www.canada.ca/en/health-canada.html	Public health act	0
Pan-Canadian Public Health Network	http://www.phn-rsp.ca/index-eng.php	Public health act	0
Canadian Institute for Health Information	https://www.cihi.ca/en	Public health act	0
Canadian Public Health Association	https://www.cpha.ca/	Public health act	0
National Collaborating Centre for Environmental Health	http://www.ncceh.ca/	Public health act	0
Newfoundland and Labrador. Canada. Health and Community Services	https://www.health.gov.nl.ca/	Public health act	1
House of Assembly, Newfoundland and Labrador.	https://www.assembly.nl.ca/	Public health act	0
Newfoundland and Labrador. Public Health Association.	https://www.nlpha.ca/	Public health act	0
Government of British Columbia	https://www2.gov.bc.ca/	Public health act	5
Public Health Association of British Columbia	https://phabc.org/	Public health act	0
BC Medical Journal	https://www.bcmj.org/	Public health act	0
Office of the Auditor General of British Columbia	https://www.bcauditor.com/	Public health act	0
Government of Manitoba: Health, Seniors and Active Living	https://www.gov.mb.ca/health/	Public health act	0
Government of Manitoba	https://web2.gov.mb.ca/ https://www.manitoba.ca	Public health act	2
University of Manitoba. Manitoba Centre for Health Policy	http://umanitoba.ca/faculties/health_sciences/medicine/units/chs/departmental_units/mchp/	Public health act	0
Government of Manitoba: Health, Seniors and Active Living: Infection Prevention and Control	https://www.gov.mb.ca/health/publichealth/cdc/ipc.html	Public health act	0

Google.com searches: First 100 results		
Search terms	Results	Relevant results
Manitoba "public health act" (Verbatim search, 2005-2019	About 74,500 results (0.47 seconds)	6

"British Columbia" "public health act" 2005-19	About 822 results (0.17 seconds)	9
"Newfoundland" "public health act"	About 98 results (0.55 seconds)	1
Google Scholar: First 100 results		
Search terms	Results	Relevant results
Manitoba "public health act" 2005-19	about 471 results (0.05 seconds)	4
"British Columbia" "public health act" 2005-19	about 102 results (0.42 seconds)	5
"Newfoundland" "public health act" 2005-2019	About 256 results (0.09 seconds)	1
Canada: Total Grey literature search results		
		34

3. **Croatia**

Croatia: websites searched			
Organization	Website address	Search terms	Relevant results
Central Catalog of Official Documents of the Republic of Croatia	http://www.digured.hr	"Health care act" ; Zakon: O Zdravstvenoj Zastiti	0
Ministry of Health	https://zdravstvo.gov.hr/	"Health care act" ; Zakon: O Zdravstvenoj Zastiti	0
Open Data Portal of the Republic of Croatia	http://data.gov.hr/	"Health care act" ; Zakon: O Zdravstvenoj Zastiti	0
Ministry of Demography, Family, Youth and Social Policy	https://mdomsp.gov.hr/	"Health care act" ; Zakon: O Zdravstvenoj Zastiti	0
Portal of Croatian Scientific and Professional Journals - Hrčak	https://hrcak.srce.hr/	"Health care act" ; Zakon: O Zdravstvenoj Zastiti	0
Google.com searches: First 100 results			
Search terms		Results	
Croatia "Health care act"		About 87 results (0.64 seconds)	7
Zakon: O Zdravstvenoj 2005-19Zastiti		About 148 results (0.94 seconds)	0
Google Scholar: First 100 results			
Search terms		Results	Relevant results

Croatia "Health care act"2005-2019	About 311 results (0.10 seconds)	11
Croatia: Total Grey literature search results		
		18

4. Finland

Finland: websites searched			
Organisation	Website address	Search terms	Relevant results
Finnish Government	https://valtioneuvosto.fi/etusivu https://valtioneuvosto.fi/en/frontpage	Communicable disease	0
		Communicable disease legislation	0
		Infectious disease	0
		Infectious disease legislation	0
		tarttuvia tauteja koskeva lainsäädäntö	0
		tarttuva tauti	0
Ministry of Social Affairs and Health	https://stm.fi/en/frontpage https://stm.fi/tartuntataudit	Communicable disease	0
		Communicable disease legislation	0
		Infectious disease	1
		Infectious disease legislation	0
		tarttuvia tauteja koskeva lainsäädäntö:	0
National institute for Health and welfare Infectious Disease	https://thl.fi/fi/web/infektiotaudit	Communicable disease	0
		Communicable disease legislation	0
		Infectious disease:	0
		tarttuvia tauteja koskeva lainsäädäntö:	0
		Infectious disease legislation	0
FINLEX (Finnish legislative and judicial information)	Communicable Diseases Act http://www.finlex.fi/fi/laki/smur/2016/20161227		0
Ministry of Social Affairs and Health legislation	https://stm.fi/en/projects-and-legislation/key-projects	Infectious disease	0

		Communicable disease	2
Julkari (shared open repository for publications of the Ministry of Social Affairs and Health's administrative branch organisations)	http://www.julkari.fi/	Tartuntatautilaki 1227/2016 tarttuvia tauteja koskeva lainsäädäntö "Communicable disease" legislation "infectious disease" legislation	0

Finland: Google.com searches 1st 100 results		
Search terms	**Results**	**Relevant results**
"Communicable disease" legislation "Finland"	About 105 results (0.71 seconds)	2
"public health" legislation Finland	About 142 results (0.47 seconds)	0
tarttuvia tauteja koskeva lainsäädäntö **[legislation on communicable diseases]**	About 65 results (0.55 seconds)	6
Tartuntatautilaki 1227/2016	About 102 results (0.32 seconds)	0
Tartuntatautiasetus	100 results (0.38 seconds)	0
Sosiaali- ja terveysministeriön asetus rokotuksista	About 76 results (0.34 seconds	0
"1227/2016" Finland	About 98 results (0.46 seconds)	1

Finland: Google Scholar searches 1st 100 results		
Search terms	**Results**	**Relevant results**
"Communicable disease" legislation "Finland"	About 105 results (0.71 seconds)	2
"public health" legislation Finland	About 142 results (0.47 seconds)	0
tarttuvia tauteja koskeva lainsäädäntö **[legislation on communicable diseases]**	About 65 results (0.55 seconds)	6
Tartuntatautilaki 1227/2016	about 102 results (0.32 seconds)	0
Tartuntatautiasetus	About 138 results (0.05 seconds), of which 4 =English language only	0
Sosiaali- ja terveysministeriön asetus rokotuksista	6 results (0.05 sec) English language only	0

Total Grey literature search results	
	18

5. **Netherlands**

Netherlands: websites searched			
Health~Holland	https://www.health-holland.com/portal/rules-and-regulation	Public health "Wet Publieke Gezondheid"	0
Health Council of the Netherlands	https://www.healthcouncil.nl/	"Wet Publieke Gezondheid" "Public health act"	0
Council for Health and Society (Raad voor Volksgezondheid en Samenleving, RVS)	https://www.raadrvs.nl/	"Wet Publieke Gezondheid" "Public health act"	0
Global Health Law Groningen Research Centre	https://www.rug.nl/rechten/onderzoek/expertisecentra/ghlg/blog/	"Wet Publieke Gezondheid" "Public health act"	0
Inspectie Gezondheidszorg en Jeugd.ministeri van Volksgezondheid, Welzijn en Sport (health inspectorate)	https://www.igj.nl/	"Wet Publieke Gezondheid" "Public health act"	0
Guide to information and services from all governments	https://www.overheid.nl/	"Wet Publieke Gezondheid" "Public health act"	0

Google.com: First 100 results		
Search terms	Results	Relevant results
Netherlands "public health" legislation	About 161 results (0.58 seconds)	8
Public Health Act "Wet Publieke Gezondheid"	About 87 results (0.49 seconds)	20

Google Scholar: First 100 results		
Search terms	Results	Relevant results
Public Health Act "Wet Publieke Gezondheid"	About 172 results (0.09 seconds)	2
Netherlands "public health" legislation (Limit: 2005-2019)	About 40,900 results (0.04 sec)	4
Netherlands Dutch "public health Act" (Limit 2005-2019)	about 740 results (0.07 sec)	6

Netherlands: Total Grey literature search results	

6. **Poland**

	Poland website searches		
Organization	Website address	Search terms	Relevant results
Polish government	https://www.premier.gov.pl/en.html (will not open 2nd page of search results)	"Act of 11 September 2015"	0
		"Dz.U. 2015 poz. 1916"	0
		"public health act"	0
Polish ministry of health	https://www.gov.pl/web/zdrowie/	"Act of 11 September 2015"	0
		"Dz.U. 2015 poz. 1916"	0
		"public health act"	0
National Centre for Research and Development in Poland	https://www.ncbr.gov.pl/	"Dz.U. 2015 poz. 1916"	0
		"public health act"	0
Polish government portal	https://www.gov.pl/	"Act of 11 September 2015"	0
		Journal of laws 2015 item 1916	0
		"Dz.U. 2015 poz. 1916"	0

Poland: Google.com searches First 100 results		
Search terms	Results	Relevant results
Poland "Public health" legislation	About 6,430,000 results (0.56 seconds)	11
"Poland" "communicable disease" legislation 2005-present	About 150 results (0.44 seconds)	4
Poland "public health act"	About 106 results (0.43 seconds)	5
"Act of 11 September 2015" Poland "public health"	About 27 results (0.48 seconds)	5
"Dz.U. 2015 poz. 1916"	About 121 results (0.28 seconds)	0
"Dz.U. 2015 poz. 1916" "health"	About 44 results (0.28 seconds)	0

Poland: Google Scholar searches. First 100 results

Search terms	Results	Relevant results
Poland "Public health" legislation (2005-2019)	About 18,900 results (0.09 seconds)	2
"Poland" "communicable disease" legislation 2005-present	About 3,390 results (0.09 sec)	2
Poland "public health act"	About 1,840 results (0.16 sec)	5
"Act of 11 September 2015" Poland "public health"	7 results (0.13 sec)	0
"Dz.U. 2015 poz. 1916"	13 results (0.09 sec)	0
Poland: Total Grey literature search results		
		34

7. Portugal

Portugal: websites searched			
Organization	Website address	Search terms	Relevant results
Governo da República Portuguesa (Government of the Portuguese Republic)	https://www.portugal.gov.pt/pt/gc21	"public health" legislation	0
		"public health act"	0
		"communicable disease" legislation	0
		"infectious disease" legislation	0
Servico Nacional de Saúde (Ministry of Health)	https://www.sns.gov.pt/	Public health; health system/legislation, law, act, decree lei básica de saúde Portugal nova Lei de Bases da Saúde Proposta de Lei n.º 171/XIII	0
Diário da República Electrónico (Official Journal)	https://dre.pt/	Lei básica de saúde Portugal nova Lei de Bases da Saúde Proposta de Lei n.º 171/XIII	0
Assembly of the Republic (Parliament)	https://www.parlamento.pt	Lei básica de saúde Portugal nova Lei de Bases da Saúde Proposta de Lei n.º 171/XIII	0
Ministry o Health	http://www.acss.min-saude.pt	Lei básica de saúde Portugal nova Lei de Bases da Saúde Proposta de Lei n.º 171/XIII	0
Portugal: Google.com searches: First 100 results			

Search terms	Results	Relevant results
Portugal "public health" legislation	About 173 results (0.71 seconds)	6
“Public health act" portuguese Portugal (Limit: 2005-2019)	about 113 results (0.44 seconds)	0
"Portugal" "communicable disease" legislation	about 118 results (0.43 seconds)	3
"Portugal" "infectious disease" legislation	about 118 results (0.51 seconds)	0
"Portugal" public health reform	about 168 results (0.49 seconds)	7
Portugal Google Scholar searches: First 100 results		
Search terms	Results	Relevant results
Portugal "public health" legislation	About 79,000 results (0.07 seconds)	2
"Public health act" portuguese Portugal (Limit: 2005-2019)	About 115 results (0.11 seconds)	0
"Portugal" "communicable disease" legislation	About 2,840 results (0.05 seconds)	0
"Portugal" public health reform (Limit: 2005-19)	About 75,100 results (0.10 seconds)	6
Portugal: Total Grey literature search results		
		24

8. Scotland

Scotland: websites searched			
Organisation	**Website address**	**Search terms**	**Relevant results**
Department of Health, Scottish Government	https://www.gov.scot/Topics/Health	Infection control Infection control legislation Communicable disease Communicable disease legislation "public health etc" "public health" legislation	0
The Scottish Government	https://www.gov.scot/	Infection control Infection control legislation Communicable disease Communicable disease legislation "public health etc"	0
Healthcare Improvement Scotland	http://www.healthcareimprovementscotland.org/	Infection control Infection control legislation Communicable disease	0

		Communicable disease legislation "Public Health etc" "public health" legislation	
NHS Scotland	https://www.scot.nhs.uk/	Infection control legislation Communicable disease Communicable disease legislation "public health etc" "public health" legislation	0
NHS Scotland publications	https://www.publications.scot.nhs.uk/	Infection control Infection control legislation Communicable disease Communicable disease legislation	0
NHS Health Scotland Annual and Corporate reports	http://www.healthscotland.scot/our-organisation/annual-and-corporate-reports/annual-reviews-and-self-assessments-accounts-and-reports	Manually read through the report titles	0
	http://www.healthscotland.scot/	"public health etc" "public health etc (scotland) Act"	0
Public health information for Scotland	https://www.scotpho.org.uk/ https://www.scotpho.org.uk/publications/reports-and-papers https://www.scotpho.org.uk/publications/other-key-resources/scottish-policies-and-strategies/overarching	"Infection control" Legislation Communicable disease "public health etc" "public health" law	0
IDS Scottish Healthcare Audits	http://www.isdscotland.org/Health-Topics/Scottish-Healthcare-Audits/	Infection control "Infection control" legislation "Communicable disease" Communicable disease legislation "public health etc" "public health" legislation	0
National Institute for Health Research	https://www.nihr.ac.uk/	"Infection control" legislation Scotland "Communicable disease" legislation Scotland "Public health etc" Scottish "public Health" "public health" legislation Scotland	0
Health protection Scotland	https://www.hps.scot.nhs.uk/ https://hps-beta.azurewebsites.net/	Infection control "Infection control" legislation "Communicable disease" Communicable disease legislation	0

		public health legislation “public health etc”	
Scottish Government Health and Social Care directorates	https://www.sehd.scot.nhs.uk/	Infection control legislation Communicable disease legislation public health legislation	0
Scottish Public Health Network	https://www.scotphn.net/	Infection control legislation Communicable diseases legislation Public health legislation Public health	0
Public Health Reform	https://publichealthreform.scot/	Public health legislation "Public health etc"	0
Scotland: Google.com searches 1st 100 results			
Search terms	First 100 results		Relevant results
Scotland "Public health" legislation		Page 1 of about 131 results (0.52 seconds)	8
Scotland "communicable disease" legislation		About 198,000 results (0.75 seconds)	14
Scotland infectious disease legislation		about 119 results (0.56 seconds)	0
Public Health etc. (Scotland) Act 2008		about 103 results (0.52 seconds)	16
"Public Health etc" Act Scotland		about 84 results (0.38 seconds)	1
Scotland: Google Scholar searches			
Search terms	First 100 results		Relevant results
Scotland "Public health" legislation		about 88,100 results (0.07 seconds)	0
Scotland "communicable disease" legislation 2005-present		About 4,870 results (0.05 seconds)	0
Public Health etc. (Scotland) Act 2008		About 61 results (0.11 seconds)	1
Public Health etc Act		1 result (0.22 seconds)	1
Scotland: Total Grey literature search results			
			41

Appendix D Critical appraisal full explanation

Critical appraisal of quantitative analysis studies: full explanation

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
Nelson 2019	Yes	All notifications between 1 January 2016 and 3 December 2017 were included	Yes	All notifications between 1 January 2016 and 3 December 2017 were included	Yes	"Time-to-notification was calculated as the number of days between the earliest 'signature date' (the date the notification was authorised by doctor/laboratory, signifying the day of diagnosis and/or result finalisation) and the 'event date' (the date DHHS[Department of Health and Human Services] received the	Yes	As this was an audit, there are no non-responders.	Yes	Data were analysed in Stata version 15 comparing urgent versus routine, doctor-notified versus laboratory-only notifications in 2017 versus 2016 using chi-squared tests with relative risks (RR) and 95% confidence intervals (95% CI) generated. Analysis is clearly stated and appropriate for

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
						notification).” p3 Measures are well defined and appropriate for purpose.				the research question.
Gibney 2016	Yes	All notifications from 2013 were included.	Yes	All notifications from 2013 were included.	Yes	Case classification, number of notifications per case, and notification source (doctor, laboratory, or both) was described for all notifications. All other analyses, including data completeness and time to notification, were restricted to confirmed and probable cases. Measures are well defined and	Yes	As this was an audit, there are no non-responders.	Yes	Notification outcomes for different groups – including cases notified by a laboratory but not a medical practitioner (laboratory-only notified cases), along with cases notified by a medical practitioner ± laboratory (doctor-notified cases); follow-up by public health staff, which is routine for all notified cases of Group A

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
						appropriate for purpose.				conditions and selected Group B, C, and D conditions, versus not routine; and priority for Indigenous status reporting for 18 priority conditions versus all other conditions – were compared using chi-squared tests, and RR and 95% CI were generated. A *p*-value of <0.05 was considered statistically significant. Analysis is clearly stated and appropriate for the research question.

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
van Dijk 2015	Yes	Randomly drawn sample	Yes	The paper states that the sample was randomly drawn from the Dutch GP registration and that the sample was representative	Yes	"Structured questionnaires for GPs and practice assistants were developed based on a literature study on experiences of healthcare workers during the influenza A(H1N1) pandemic, and on the results of four in-depth interviews with GPs who had worked during the influenza pandemic in the Netherlands. The questionnaire was tested in a pilot study to assess its feasibility and completeness	No	High non-response rates (GP: 55%; practice assistant: 40%); however, statistical analysis was undertaken to determine what variables were responsible for these rates.	Yes	The statistical analyses were clearly stated and justified for the design and research question. Data were analysed using Stata version 12.1. Descriptive statistics were generated. The 4-point Likert scale was recoded into '(strongly) agree' and '(strongly) disagree', and the 5-point Likert scale was recoded into 'excellent/good', 'neutral', and '(very) poor', due to a low number of cases in the extreme

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
						involving GPs and researchers. Based on results of the pilot study, final questionnaires were adapted and sent to general practices." (p4)				categories. Non-responder analyses were performed for GPs' sex, age, function, practice type, and the degree of urbanisation of the practice's location.
WHO JEE Australia 2018	Can't tell	No description of sample selection	Yes	Government Departments and relevant external organisations were all well represented, as listed in the appendix of the report	Yes	The JEE uses a standard tool to review national capacities across 19 technical areas related to health security.	Can't tell	Not assessed	Yes	No statistical analysis performed
WHO JEE Finland 2017	Can't tell	No description of sample selection	Yes	Government Departments and relevant external organisations were all well represented, as listed in the	Yes	The JEE uses a standard tool to review national capacities across 19 technical	Can't tell	Not assessed	Yes	No statistical analysis performed

Study ID	4.1. Is the sampling strategy relevant to address the research question?	Comment on 4.1	4.2. Is the sample representative of the target population?	Comment on 4.2	4.3. Are the measurements appropriate?	Comment on 4.3	4.4. Is the risk of non-response bias low?	Comment on 4.4	4.5. Is the statistical analysis appropriate to answer the research question?	Comment on 4.5
				report's appendix		areas related to health security.				
WHO JEE Canada 2019	Can't tell	No description of sample selection	Yes	Government Departments and relevant external organisations were all well represented, as listed in the report's appendix.	Yes	The JEE uses a standard tool to review national capacities across 19 technical areas related to health security.	Can't tell	Not assessed	Yes	No statistical analysis performed
Low 2010	Yes	All laboratory-confirmed cases notified from healthcare institutions during the containment phase. 350 cases were identified.	Yes	–	Yes	WHO targets used	Yes	Not applicable	Yes	No statistical analysis performed

Critical appraisal of qualitative analysis studies: full explanation

Study ID	1.1. Is the qualitative approach appropriate to answer the research question?	Comment on 1.1	1.2. Are the qualitative data collection methods adequate to address the research question?	Comment on 1.2	1.3. Are the findings adequately derived from the data?	Comment on 1.3	1.4. Is the interpretation of results sufficiently substantiated by data?	Comment on 1.4	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	Comment on 1.5
Connolly 2015	Yes	Case study method	Yes	This case study uses mixed qualitative methods, including a thematic analysis of secondary sources, as well as official government documentation and in-depth semi-structured elite interviews with policy actors. The use of mixed qualitative methods is justified as: “The analysis of documentation served to support the identification of interviewees and contributed to the themes that structured interview schedules.”(p371)	Yes	Data from interviews were thematically coded around the most significant strategic policy challenges to emerge from the data.	Yes	Quotes from interviews are provided in the findings section.	Yes	There are clear links between data sources, collection, analysis, and interpretation.
Todrys 2013	Yes	Case study method	Can't tell	Methods of data collection not clear	Can't tell	Method of data analysis not reported	Yes	Quotes used to support findings	Can't tell	With no data on the chosen methods for

Study ID	1.1. Is the qualitative approach appropriate to answer the research question?	Comment on 1.1	1.2. Are the qualitative data collection methods adequate to address the research question?	Comment on 1.2	1.3. Are the findings adequately derived from the data?	Comment on 1.3	1.4. Is the interpretation of results sufficiently substantiated by data?	Comment on 1.4	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	Comment on 1.5
		selected, as the examined outcome is rare.								collection and analysis, we cannot determine if there is coherence between sources, collection, analysis, and interpretation.
Rowe 2019	Yes	Thematic analysis of people's experiences	Yes	Semi-structured interviews, with notes taken during interviews. Notes were reviewed and clarification sought from key informants if required.	Yes	Thematic analysis: Responses from each jurisdiction relating to their availability and use of existing data linkage infrastructure, as well as their availability and use of disparate datasets, were tabulated. Commonly cited barriers to and enablers of data linkage were synthesised into	No	Quotes not used	Yes	Differences between the states were discussed

Study ID	1.1. Is the qualitative approach appropriate to answer the research question?	Comment on 1.1	1.2. Are the qualitative data collection methods adequate to address the research question?	Comment on 1.2	1.3. Are the findings adequately derived from the data?	Comment on 1.3	1.4. Is the interpretation of results sufficiently substantiated by data?	Comment on 1.4	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	Comment on 1.5
						overarching themes where possible.				

Critical appraisal of mixed methods studies: full explanation

Study ID	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	Comment on 5.1	5.2. Are the different components of the study effectively integrated to answer the research question?	Comment on 5.2	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	Comment on 5.3	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Comment on 5.4	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	Comment on 5.5

Javanparast 2019	No	No rationale given	Yes	Results from a survey, telephone interviews, and documentary analysis are presented together in order to give the complete picture.	Yes	Results from a survey, telephone interviews, and documentary analysis are presented together in order to give the complete picture.	Yes	No divergence reported	Can't tell	Quality of qualitative analysis is good. However, there is very little description of the methods for the quantitative analysis, including the sampling strategy and the measurements used.

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